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Lost treasure...

A specially commissioned gold and diamond prize valued at £5,000 is on offer to Spectrum owners.

Automata Cartography is the software house which will give the prize to the first person to solve its elaborate computer adventure, Pimania.

The prize is called the Golden Sundial of Pi and an exclusive report on this Mosqueroade-like quest can be found on page 85.

Puzzling is the start of a new column which takes over from our old Brainware feature. It should provide something for everyone with a few moments to while away. See page 72.

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YULETIDE INVADERS

NEXT

The world of electronic toys and games comes to Computer & Video Games.

Still in time for Christmas we'll be sifting through the latest bleeping, burping and talking creations which are chipping away at the established toy market.

For the chess enthusiasts amongst you, we'll have a rundown on the chess machines which are expected to sell this yuletide. From the expensive coffee-table versions, to the travelling companion sets, we'll find out the advantages these dedicated machines have over microcomputer chess programs.

And completing Santa's shopping list will be a pack of the software selection for TV Games Centres and the more popular computers.

THE SHAPE OF THINGS . . .

NEXT

The more observant among you, may have noticed a few changes taking place among C&VG's more regular features.

The disappearance of Down to Basic is one example. In this issue you will find no Brainware as this has been replaced by our Puzzling pages. And other changes to the format are coming soon.

Down to Basic will be replaced next month by a column more suited to most home computer owners — and especially the games players. Machine code is already understood by many of C&VG's readers (especially the younger ones it seems) but for those of you who have not yet grasped the fundamentals we are starting up a column to help you get to grips with it.

The column is being written by Ted Ball and since we don't want to overload him too much, the December *Practical Programming* will be the last in the series.

Our machine code series will quickly be followed by an article showing you how to put your new-found knowledge to good use in setting up a wargame format, but more of that at a later date.

Kat Korner is also coming to the

This here's my newsagent



Me n' my newsagent are real close. His name's Bill or Fred or something. Anyway we got an arrangement. Every month, you know what he does? He looks out my copy of *Computer & Video Games* and keeps it just for me.

So none of the other punks on the street can get hold of my copy. And that's important to me. Mebbe it's important to you too. So go n' see your newsagent with that coupon below all filled out. If he's like Harry here, you're gonna like him.

end of its run. And Keith Mott will be writing his last piece for us under that banner in this issue. Then he is being rested for December before returning in January with a projects page which will help you to get more out of your computer.

GAME WITH A DIFFERENCE

NEXT

The Seventh Empire was the rebel which challenged the stable rule of the known galaxy and set a pattern of warring confusion which holds sway to this day.

Piracy became commonplace, no planet was safe from the threat of invasion and whole star systems changed allegiance as the tribes fought for the raw materials on which galactic fortunes rested.

The Seventh Empire is the name of a computer game so different it will take us three issues to get it started. December sets the scene of the game which can even be played by those without a home computer.

To my newsagent, please deliver/ reserve me a copy of *Computer & Video Games* every month. Price 75p.

Name

Address

STAR GUARD FOR GRANNY!

NEXT

Star Guard sets you the task of preserving fuel pods from a fleet of attacking aliens.

Granny is probably not in the best of taste but his heart is in the right place so we published it anyway.

MARK GETS HIS PRIZE

Winner of our Beat-the-Bugs Competition, Mark Williams from Sutton Coldfield in Birmingham came down to visit us and collect his BBC Model B machine.

Mark was also given a selection of Acornsoft cassettes to go with his machine — courtesy of Small Enterprises and Acorn.

But his success did not stop here, for a local businessman, who heard of Mark's programming expertise has asked him to help set up a microcomputer system for his insurance broker firm.

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SPOT THE BODGE!

Dear Sir,
After unscrambling your Mars Defender program for the ZX81 — talk about spot-the-bodge, huh! I found that the game itself was very enjoyable and interesting and I must hasten to add that the unscrambling bit was fun — GREAT FUN!

My high score was 835 and this was obtained after changing the loop in 'E' (line 70 — yes the one that looked like you had a rush of M/C to the brain: 'OINKYES' — I ask you) to FOR E = 9 TO 1 so that another 'group of aliens' — denoted by a 'A' — attack before the loop ends.

Then I proceeded to add a flagship (OU — so it was an inverse 'less-than' sign) which looked real menacing — honest! I was scared — petrified! This gave a random score between 0 and 36 by using LET S = 5 + (10 - E) * (INT(RND*5)) * (BS/E) < > (3) and pushed my final highest score to 822 — yes 822 — let's see someone beat that then!

Philip Hall,
Hinley,
Leicestershire.

FRUSTRATED OWNER

Dear Sir,

Thank you for a very good and interesting magazine, it has been a great help to me and my programming over the past month.

However, I own a TRS-80 colour computer and being a video game fanatic, I am getting very frustrated. I don't expect a program listing in your magazine every month as I do understand that the TRS-80 colour computer does not seem to be very popular, but a mention in your September Graphics feature

would have been pleasing.

I cannot understand why the computer does not seem very popular with established TRS-80 model 1 and 3 software producers, I am finding it very difficult to get new software.

However, I would like to pass on a bit of information, if I may, to other users. I have been in contact with Microdeal of Bodmin, Cornwall, and found that they have a lot of imported products for the colour computer. So there seems to be a ray of hope there! Mr A.E. Mann, Boston, Lincolnshire

VIEWS ON MICROVADERS

Dear Sir,

In response to your request for comments on the Microvaders program in the July issue. Here are mine:

1. Having the machine code in separate REM's and putting it up to the top of the memory is a big advantage over putting it on top of a REM full of 0's.

2. Unfortunately I found that the M/C program to move it up in the memory didn't work. So I wrote a basic program to do this for me but it takes about 50 seconds.

3. The M/C program in line one as printed is very ambiguous, as the question

mark can mean many things.

I enjoyed playing the game with my home-made joystick. I am looking forward to more M/C programs in Computer and Video Games.

Adrian Ellis
Worsley,
Manchester.

DISC DRIVE DOUBLE...

Dear Sir,

Your reply to Mr Spencer in the September issue stated that there were no disc drives available for the Sinclair ZX81. At present I know of two disc drive systems for the computer. One is produced by Monolith Systems and the other by Macronics.

As both companies keep lowering their prices in competition, it is hard for me to say a price. My advice would be that Mr Spencer contacted the two companies.

These addresses are:
Monolith Systems, 5/7 Church Street, Crewkerne, Somerset.
Macronics, 28 Spiers Close, Knowle, Solihull, West Midlands.

I am glad to see a binder from my copies of Computer and Video Games — they will no longer be strewn all over the floor! By the way keep up the good artwork both inside and front covers. James Mortlemann, South Woodford, London.

SOME ALIEN BUG TROUBLE

Dear Sir,

Thank you for the amendment sheet concerning the Microvaders program from your July 2 Extra supplement. Unfortunately, this was not enough to make the program work.

I wrote to Microx requesting an original listing. I received prompt attention, a listing and the answer to my problem.

Mr P.W. Norris of Microx pointed out that in line 18 of the program the 10th character from the end of the line is a 'B' and not an '8', which is almost unbelievable when looking at the listings.

I wish to express my thanks to both your magazine and to Microx, for your attention, to which end I hope you publish this letter.

Mr C Brooks,
Cheltenham,
Gloucestershire

DISCOVERING TEXAS...

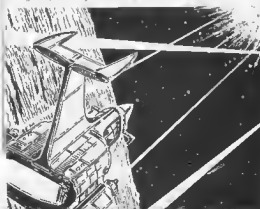
Dear Sir,

I bought your magazine for the first time in September and I was quite startled to find so many programs in your magazine for only 75p!

I recently bought my son a Texas Instruments computer and I am looking for game programs for him to occupy himself with. I looked through your magazine and did not find any TI programs. After all the TI is a good computer so why is your magazine neglecting this well developed piece of machinery?

P. Evans,
Great Yarmouth,
Norfolk

Editor's reply: Our magazine is now on the TI bandwagon Mr Evans, there is Space Laser in this issue.



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MAILBAG



PLAYING THE MICRO GAME

Dear Sir,
Thank you for a marvellous and good value for money magazine which I have read from issue one. I particularly like Video Screens and Arcade Action.

Being a newcomer to the micro scene I would be grateful if you could help me over the problem of which micro to buy.

My main reason for wanting a micro is for playing good quality games and high resolution graphics are important to me. My price boundary is about £200. Can computers at this price play games up to the standard of Mattel's Intellivision?

Finally, having owned an Intellivision for quite some time now, I would be grateful if you could update me of any new developments to do with Mattel's computer.

David Liddle,
Hexham,
Northumberland.
Editor's reply: To answer your last question first David, the standard of software for most of the popular home computers is as high as Intellivision games.

Sound and good quality graphics are available from several machines under your £200 ceiling. The VIC-20, Spectrum, Atari 400, T.I.99/4s and the Dragon may all be worthy of your attention. For further details on what these machines are capable of read our Buyers Guide on page 86.

FROM THE SHARP ENO

Dear Sir,
I have recently acquired the use of a Sharp MZ-80K computer. Unfortunately however my programming knowledge is limited and I cannot yet make my own good games listings.

Your magazine was recommended to me by a friend as having many listings for the MZ-80K, but I have found to my disappointment that you do not.

Please print some

interesting, exciting and adventurous programs for my computer. You often do a Sinclair Selection so why not do this for other computers. I know several programmers in my area who would also appreciate more Sharp programs
John King,
Cheadle Hulme,
Cheshire.

Editor's reply: Hardly fair criticism John. The Sharp has frequently been the computer to feature our "star" games. Ideally we would like to have several programs for each computer, each month, but space restrictions make this impossible. The Sinclair Selection you mention, consisted of only 1K programs which would be a waste on the Sharp's large memory capacity.

BACK TO BASICS

Dear Sir,
First of all, a great magazine! Glad to see that there is a colourful magazine bringing a bit of relief to the usually dreary magazine racks.

I have purchased all but two of your issues, and was particularly interested in June edition which featured World Cup Manager. I am a great football fan, and would very much like to try this game, if only I had a Sharp MZ-80K. Unfortunately, I haven't got access to one of these

machines, but am at present awaiting the delivery — seven weeks so far — of my 48K Sinclair Spectrum.

I have not yet been able to grasp the more difficult aspects of Basic programming. I attempted, however, to convert World Cup Manager game to run in Sinclair Basic, but I became stuck with a few things and was wondering if you could help me to convert such expressions as "Left \$", "Right \$", "Mid \$", and "On I Goto . . ." into Spectrum Basic.

Please could you help by publishing those lines of the program concerned as I would dearly love to try the game on my Spectrum, when it arrives.

S. A. Wiltshire,
Peterborough,
Cambridgeshire
Editor's reply: LEFT \$(a\$,n) by a\$(1 to n) RIGHT \$(a\$,n) by a\$(n to 1) where L = L\$Na\$ and MID \$(a\$,n,L) by a\$(n to L) on I GOTO by IF 1 = 1 THEN GOTO 100 IF 1 = 2 THEN GOTO 200

VIC MEETS BUZZY!

Dear Sir,
I am writing to your very good magazine with the hope that you could answer some questions.

Please could you tell me if any company produces adventure programmes for an unexpanded or expanded VIC-20, i.e. Scott Adams.

Also when I bought my computer a friend bought one at the same time — they are both VIC-20s. Is there any way that my VIC-20 and his Vic can swap programmes, communicate, etc. — over the telephone lines?
Richard T. Gilday,
Ramsgate,
Kent

Editor's reply: Yes, Richard you can link up with your friend using the telephone lines. You need an IEEE488 capability and this can be provided by the appropriate interface, say VIC1112 at £44 from Commodore.

Commodore have published some software for PETS connected together and this can be adapted for the VICs. I suggest you contact them at their offices in Slough for programs. The address is 675 Ayles Avenue, Slough, Berkshire.

There are a variety of Scott Adams Adventure games which can be purchased from Commodore.

MORE FOR UK, OK?

Dear Sir,
Thank you very much for a brilliant magazine, it is the best money can buy. I have only one complaint. I have not seen any reviews of UK101 software, please could you publish one.

Being a UK101 owner, it is rather difficult for me to translate programs from VIC, Atari, ZX81 and the like. I am sure many UK101 owners would love to see a program for their machine published in your magazine.
Bobby Lynas,
Margate,
Kent

Editor's reply: There is not much games software around for the UK101 Bobby, but when we do get to hear of a new game, we will cover it in our Games News section. The UK101 has never really been seen as a games player's computer which probably accounts for this lack of software. Nat, space permitting, I will try to feature a UK101 game in the future.



Every Fantasy Should Have Its Own Dragon



In the realm of fantasy, one computer has to stand out. I refer of course to the Dragon 32 smoking away quietly in that dark corner.

A Dragon microcomputer will go to the winner of our fantasy ideas competition. So if you could find room in your house for a well-behaved Dragon then read on... or better still read the feature on page 24 first.

If you've digested the tips on building your own computer fantasy game we now want you to dig deep into your imagination and come up with just such a game.

You can either go back in history (or even pre-history) to set your game against a backdrop, like Gladiators. Or you can go forward into a distant future.

But fantasy should put no holds or bars on your imagination and perhaps you would like to set this particular adventure in a time that never was.

Your entry should include:

- The idea: not just a title but a description of how you think the game would work and how it would be operated.
- The algorithms: the basic functions which would form the core of the program and determine the outcome of conflicts.
- Practicality: a paragraph outlining why you think the game would be commercially viable.

The entries should be sent to: Fantasy Competition, Computer & Video Games, Durrant House, 8 Herbal Hall, London EC1R 5JB and reach us before 16 November 1982.

They will be judged by Mitre

The Welsh Dragon has made a fiery entrance to the microcomputer market.

Styling itself the "family" microcomputer, it is selling well at its £199 price tag and looks set for a good Christmas.

The winner of our Fantasy Game Competition will have a Dragon on his hearth complete with 32K of memory and a screen size of 16 lines by 32 characters.

It plugs into the common domestic television and uses a household cassette recorder to save and load programs.

It already has several fantasy adventures in its software range and with independent software houses now producing games cassettes for it, the machine should soon have a comprehensive library of games software behind it.

So no dragon feet, get those imaginations working overtime and those entries off quickly.

Wargames, whose Mark Blundell wrote the article on building a fantasy game and if they are sufficiently impressed, Mitre have undertaken to try and turn the winning entry into a computer moderated game and invite the prizewinner to help produce and market it on a royalties basis.

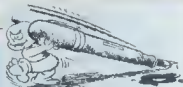
Employees of EMAP, Dragon Data and Mitre Wargames and their relatives may not enter the competition. The judge's decision is final and no correspondence will be entered into.

BRAINWARE

The answers to last month's Mind Routine are:

1. Maximum product of node sums = 34012224
2. Minimum product of node sums = 25623600
3. Maximum sum of node products = 2925
4. Minimum sum of node products = 1212

The solution to October's Nevera Crossword is printed right.



Confessions of a Bug

There's nothing we Bugs like better than a good Atan program to get our teeth into.

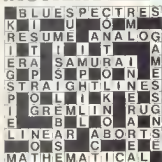
T. Hitch has run up an Atan bugging routine so sophisticated and subtle that it defies solution.

Take Wild Strawberries for example: never in the history of this magazine has a readership been so split over a program. Half of them seem completely unable to get the game running no matter what. The other half are phoning up to congratulate C&VG on producing such a good Atan game which runs first time on being entered. Even better, the ones who have problems all claim a different line as being the culprit.

You should see the poor editor tearing his hair out trying to understand what's going on. The only piece of advice he can offer is to check all the 0s and Os in the program carefully.

Vic owners may have had some difficulty with Brick Blaster as the cursor control symbols have printed up badly. If you have had problems with this game please ring or write for a correction sheet.

ANSWERS



PINBALL PATIENCE

If you have entered our Pinball Competition please be patient as these have to go to America to be judged by the Bally Pinball Division.

They will be back to us soon to give us their nomination for the lucky winner, who is due to receive a Bally Electric Pinball in his front room.

And hopefully find that Bally have taken his design ideas and incorporated them into the sort of pinball machine he would like to play.

But a special thanks from me to all the many people who put so much effort into the competition.

We were overwhelmed by the standard of the response and the carefully constructed and detailed diagrams which accompanied the ideas.

The Sinclair game idea competition has been whittled down to the top 20 ideas.

These are currently with software house Psion, whose top game designers will be trying to pick an overall winner from here.

● The winners of our September Brainware Competition are: A Crowhurst of Drakes Way, Mannors Park, Portsmouth in Bristol — who won the Nevera Crossword — and Richard Parkin of Northwich Road, Weaverham, Cheshire who was first out of the hat with our Mind Roundies answer correct. Champagne is on its way to both.

OUTER SPACE ARTHUR NEGUS'S

Collecting on a galactic scale, is the task of the Itemizer race.

These outer-space Arthur Neguses are controlled by Dean Goodman and are currently engaged in notching up points in the C&VG game of Starweb.

Dean's Itemizers are currently up to their short green necks in intrigue and tactical thinking so convoluted as to make the valuing of a early Chippendale seem pedestrian in comparison.

So on with the antiques space highway show.

As the richest person in the solar system, Itemizer the artifact collector becomes monumentally excited by the idea of owning unique things.

On many of the worlds in the system there are various indestructible artifacts left behind by a now extinct race of beings.

Despite his passive nature, Itemizer will do almost anything to possess these objects, although aggression is not his strongest point.

On one occasion, driven by greed, he attacked a foreign fleet but now regrets that action as it appears to have been a tactical mistake. Overwhelming reinforcements arrived the following turn calling for a quick exit by the home fleet.

Tactics have to be adapted as other game characters reveal themselves. Because each player needs different things and because each player acts in different ways, some middle ground usually exists for negotiations and barter. Successful negotiation has so far proved difficult however.

Two fleet controllers dis-

appeared before contact had been cemented (leaving populations converted to religious extremism), and another controller destroyed the fleet sent to establish contact!

At the highest level it is important to have an overall strategy and to keep to it. Itemizer keeps his forces and artifacts close to his homeworld and avoids spreading fleets thinly. Unprotected worlds are weaknesses and the empire could become vulnerable as a result.

So what orders will be sent in next turn? The empire's centre line is under threat from a Pirate and as the extreme right flank has proved unprotective, a shift of two fleets from the right to help reinforce will be necessary. Probing fleets will be sent to explore three worlds on the left flank in the hope that more artifacts will be found.

If you get an opportunity to take in a computer-moderated game such as Starweb, jump to it. Intelligent gaming is both mentally stimulating and intensely enjoyable, despite the lengthy turn-around time (four weeks).

PUZZLING SOLUTIONS

ALL BOXED UP

Puzzling solution? Well they will be if you haven't yet found our sparkling new page of brain-teasers!

Turn to pages 72 and 73 to test out your mind, or, perhaps, your computer, before reading any further.

SWORD OR WORDS?

- | | |
|----------|-----------|
| 1 Hornet | 7 Pistol |
| 2 Round | 8 Sparta |
| 3 Batman | 9 Suffer |
| 4 Minus | 10 Raffle |
| 5 Sprout | 11 Abroad |
| 6 Escort | 12 Entrap |

COMING AND GOING

	CAR	APPROACH	EXIT
Hot Blue	4/10	—	5/10
Hot Pink	Max	11	10/10
Hot Green	Van	11	10/10
Hot Yellow	Min	11	10/10
Hot Purple	Min	11	10/10
Hot Orange	Min	11	10/10

So, Mrs. Durrant, your words (puzzles) are solved, and so are the car puzzles.

- 2 Rockets (11 51p = £1.02)
 22 Silver Serpents (11 15p = £3.30)
 17 Thunder-Claps (11 4p = 68p)
 Total £5

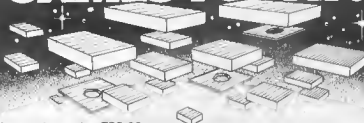
The solutions of the Mastermind competition have been held over until next month.

This will give you all a chance to test your logic circuits and see if you can come up with the four answers, unaided.

If you do, then please rush in with an entry to us at: Puzzling, Computer & Video Games, Durrant House, Herbal Hill, London EC1.

And you could win an Invicta Electronic Mastermind to practise on.

TOMORROW'S GAMES TODAY!



The most amazing TRS-80 compatible graphics software yet, with extensive use of sound, real-time etc., etc., now available from Bullock Computers.

PENETRATION

You are the sole survivor of a lighter squadron whose mission is to invade the enemy defense rings and blow up their illegal neutron bomb store. The unique customising feature allows you to change the landscape at will, giving you hundreds of different situations with just this one game. If you're only going to buy one game this year it has to be this one! Joystick compatible.

Disk £	Cass. £
19.50	16.00

ALIEN DEFENSE

In this highly sophisticated last action game you have to defend as well as attack. Your enemy is invading aliens who are intent on capturing your men. As the game progresses the action gets faster. The disk version also gives spoken information. Both versions have an attack mode. Model 1/111.

19.50	16.00
-------	-------

FORTRESS

Defend your fortress from alien fighters but watch out for the sneak attack! The game starts off slow but speeds up very quickly. Model 1/111.

19.50	16.00
-------	-------

ELIMINATOR

You're the pilot of the Eliminator, a space fighter armed to the teeth with awesome firepower. But you're outnumbered and your attackers are kept super sharp (graphics and sound). Joystick compatible.

19.50	16.00
-------	-------

DEFENSE COMMAND

The Galaxy Invaders have returned in this newest game of skill and excitement with a new twist (absolutely incredible voice effects - with high quality graphics).

16.00	12.50
-------	-------

VALEYARD

Leo Christopherson is his best. One of the finest graphics based adventures available.

30.00	26.00
-------	-------

FORBIDDEN PLANET

The hot talking adventure, three different voices. The best yet (Disk only). All voice output through cassette port - no special equipment required.

30.00	-
-------	---

ARMOUR PATROL

Real time battle action with excellent use of graphics. Requires great skill.

19.50	16.00
-------	-------

ADVENTURE (Disk system)

Now you too can create your own adventure type games. The Adventure System allows you to create a database containing your own instructions. This data base is then used by the machine language driver part of the program to actually run the adventure you just created!! (Disk only).

Disk £	Cass. £
30.00	-
30.00	-

FORBIDDEN CITY

The second follow up part of Forbidden Planet - can you escape the deadly robots?? All the features of Forbidden Planet. (Disk only).

JOYSTICKS.

Now you can add last action to all your games with our latest joystick. The adaptor for the TRS-80 includes a list of patches to allow you to use your joystick with many of the popular Arcade games. £23.00.

The following programs are available to order: Sky Warrior, Starfighter & Missile Command.

OPERATING SYSTEMS & UTILITIES

DOSPLUS 3.4/4.0.

Dosplus is the latest disk operating system from Micro Systems Software. It is the only one designed for ease of installation. Dosplus is provided with two versions of basic - most other systems only have one. Features include: built in lower case and debugger, repeat last command, ROM drivers, repeating keys and screen painter. The system also allows for memory expansion and has the ability to recover inadvertently deleted files. Dosplus 4.0 is designed for hard-disk operation. £90.00. (Dosplus 3.4 Model 1/111 single or double - please specify when ordering - Disk Only).

NECDOS.

Manufactured by Rancet - famous for Newdos the TRS-80 disk operating system. Necdos is compatible with the existing ROM BASIC provided with the NEC and gives many enhancements not available with other systems. Necdos optimizes the use of memory, performance is greatly enhanced, input-output speeds are greatly improved, and a number of new

basic statements have been added. It also has the ability via a file translation program to enable TRS-80 users wishing to upgrade to a NEC to make their software compatible with the NEC £120.00. NEC DISK.

QUICKPRO.

Automatic file orientated program generator designed for users with a limited knowledge of programming. Quickpro concentrates on file handling. Model 1/111 Disk. ONLY £100.00.

EDAS 3.5.

Edas 3.5 is a highly sophisticated Editor and Assembler for the TRS-80, featuring a very large range of functions. It is in fact the only commercially available Editor for the TRS-80. Model III EDAS Model I or Model III. £90.00.

The following programs are also available to order:

Super Utility	Lazywriter
Microplot	Basic - S/CARD
Macro-monitor	Basic - S
Super Utility Plus	

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All our prices are inclusive of VAT at 15%. Please add £1.50 for Postage and Packing. All programs available for Model 1/111. Please state Model and whether disk or cassette when ordering. 24 hour answerphone. Access Cards accepted.

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Bullock Computers Ltd, Monaco House, Bristol Street, Birmingham B5 7AS. Phone: 021-622 2167

NEW PRODUCTS NEW PRODUCTS NEW PRODUCTS NEW PRODUCTS GAMES NEWS

SOMETHING FISHY IS GOING ON . . .

FISHING, ROULETTE

Angling is one of the most popular pastimes in this country. Now you can fake up fishing without having to sit in the rain for hours, thanks to Calisto Software.

Cast your rod into the sea at the end of the pier and see how many fish you can catch on the end of your hook.

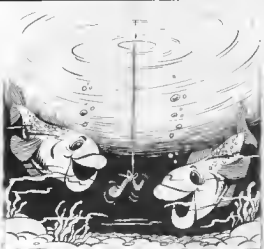
This is the simple aim of the computerised angler in Fishing — the latest game for the ZX81 from Calisto.

Side two of this cassette features a computer version of the popular casino game Roulette. The wheel is displayed on the screen — though it does not spin.

Instead the ball moves around the wheel stopping at random on one of the numbers on the wheel's perimeter.

Each player is given £1,000 to start — the game then being played according to the normal rules of Roulette. The game allows up to four people to gamble.

Roulette and Fishing are available from Harrogate based Calis to Software, at £2.50 including postage and packing.



BEWARE THE BUNKERS!

Score a hole in one without leaving your armchair in this latest computerised golf game.

This one features authentic golf course obstacles such as bunkers, trees, and of course the dreaded 'rough'. The course itself is represented on the screen in 3D and is randomly selected.

TX3 Golf is one of a new range of cassette-based games for the Texas Instruments 99/4e. Others

TX3 GOLF

in this range feature a version of the popular arcade game Battlezone, a chess program, and Four-in-a-Row, a computer version of the Connect Four game in which you must join up four counters in a faster time than your opponent.

The games are available from TX Software of Harlow, Essex at £5.00 inclusive.

THESE FINANCIAL TIMES

AIRLINE, AUTOCHIEF, PRINT SHOP

Move over Franny Laker, Charles Forte, and Rupert Murdoch as computer buffs enter the world of high finance in three new business simulations which recreate the world of airlines, printing, and hotel management.

Airline offers you the chance to play Freddy Laker for an afternoon as you decide the number of aircraft to operate, whether to buy or charter, whether to enter into a loan or a fuel contract and the levels of staffing and maintenance.

As if this were not enough to worry the would-be international airline tycoon there are also tax demands, strikes, cancelled flights, hijacks, and crashes to be taken into consideration.

Autochief casts you as the managing director of a catering

company. The forward purchasing of foodstuffs and wines must be carefully considered involving the exchange of vast sums of money. And you'd better make the right decisions for there is an angry organised group of shareholders itching to oust you from the managing director's office.

Print Shop is the last of these three business game programs. In it you have to decide the number of staff to employ, the amount of money to be tied up in paper, and the type of paper to be purchased.

Airline, Autochief, and Print Shop run on a ZX81 in 16K or in a Sinclair Spectrum. The games cost £4.75 each or £12 for three and can be obtained from London-based Case Computer Simulations.

BATTLE FOR THE MOONS OF JUPITER

MOONBASE 10

Join in the fierce battle for the moons of Jupiter! The battles are based on three well known Atan arcade games.

The game has seven different skill levels which effect the distance you have to travel to reach the moons and the speed of the approaches.

The aliens you have to do battle with in this game are alien attack ships which are worth 100 points.

Space mines are only worth 10 points but you must be careful not to crash into them as this can end you the game.

For each 1,000 points you score you will receive a reserve ship.

These are carried over from battle to battle, and appear just to the right of the score during the battle.

There are also invisible alien scout ships to contend with and if you survive the preliminary onslaughts there is ultimately the alien robot commander to be dealt with.

One interesting feature of this game is the accompanying sound commentary.

This comes on cassette with the programme and consists of side A which is a long narration to be used with the game the first time it is played and side B which is considerably shorter to be used thereafter.

Moonbase 10 runs on an Atan 400 or 800 from cassette or disc and is available from West Midlands based Softcell at £24.95.

Also new from Softcell this month is an adventure game in which you play the part of a ghost.

This ghost has the haunting task of seeking out treasure.

This treasure is hidden in 30 rooms of a haunted house — so only ghosts with high spirits need apply!

This is a real time game played using a joystick.

It costs £19.95 and runs on Atan 400 and 800.



Illustration: Terry Rogers

NEW PRODUCTS NEW PRODUCTS NEW PRODUCTS NEW GAMES NEWS

THERE IT WAS, IN THE NET!

SOCCER

Can you kick a ball to save your life? Never mind — you can still score the winner for your favourite team with a little imagination and this latest soccer simulation game.

Using a joystick you can move your player forward bringing the ball into your opponents half. Shoot by depressing the fire button on the joystick.

To tackle you simply place yourself in the front of your opponent, or intercept passes — just as in a real game.

The game features a rolling display of football field, including goals, line-markings, a clock to keep the time, and 22 players in black and white strip.

You can play against a friend,



or take on the computer.

You can also team up with a friend to tackle the computer's squad — just in case it proves to be a tough opponent!

Soccer runs on Atari 400 or an 800 and is one of a new range of games from Thorn EMI, the giant electronics company, who have now entered the microcomputer software field.

Soccer is just one of nineteen games that Thorn EMI are producing for the Atari 400 and 800.

There are also two programs available for the Commodore VIC 20 — Rover Rescue and Vic Music Composer.

The Thorn EMI range will be widely available in the months leading up to Christmas.

TOUCHDOWN AMONG THE ZOMBIES...

MOONLANDER

Moonlander challenges you to land your craft on the uncertain terrain of an inhospitable planet.

Points are scored by successfully touching down — high points being earned for landing on the narrow plateaux.

This version of Moonlander runs on a BBC Model B and is available from East-London based Software For All at £6.45 plus £1 postage and packing.

Another new BBC game from the same stable features a version of the well known computer game Zombies.

In Zombie Island you are chased around your island by a nasty bunch of Zombies. You only escape is to make them fall into the numerous potholes that litter the island.

Row of Four is a computer version of the popular Connect Four game in which you have to make a straight line of four counters before your opponent can in this case your opponent is the BBC Model B — and a very canny opponent too.

Row of Four and Zombie Island run on the BBC Model B. Both games cost £6.45 plus £1 postage and packing.

MONSTERS, ELVES AND TREASURES

KANADU ADVENTURE

A new two player adventure game is the latest novel idea for the BBC machine.

It's based on the well known fantasy role-playing game Dungeons and Dragons and includes many of the features Dungeon fans will have come to expect in a good underground adventure.

Just like the 'real-life' version there are nasties down in them dungeons.

In this version you can choose to team up with your companion to do battle with the evil assortment of elves, dwarfs and monsters that attempt to thwart you in your bid to win the treasure and escape from the caves.

You can also choose to play against another person — attempting to steal him to the glittering prizes hidden in the dark, dank caves.

Kanadu Adventure is available from Bakshi's based Hesperot at £7.75 inclusive.

STARSCRAMBLE

OMEGA MISSION

Omega Mission places you at the controls of a Starfighter thundering through space at breakneck speed.

Your mission is to destroy long waves of attacking aliens which fly at you from right to left as you navigate your ship over rocky mountain terrain, through tunnels and caves.

The first attack wave is a barrage of ground to air missiles which fly straight up towards you from the planet's surface. If you survive the missiles you fly into a cave where a storm of fireballs fly at you at great speed.

You cannot shoot these fireballs so the key to survival at this stage is to dodge.

The third stage features the alien craft themselves, followed by swimming mutants. The final test is a test of flying skill as you navigate a narrow tunnel to complete the Omega Mission.

After each mission you receive a bonus score and are then sent out on a new harder mission. The game features colour graphics and has sound effects. It also records the high score and name of player.

Omega Mission is based on

the popular arcade game Scramble and is one of a new range of games which are based on arcade favourites from Epsom based Microman. The game runs on a 12K Acorn Atom and costs £7 inclusive.

Also featured in this range of games are versions of Defender, Puckman, Centipede, and Missile Command.



Illustration: Terry Rogers

NEW PRODUCTS NEW PRODUCTS NEW PRODUCT GAMES NEWS

SINISTER SERPENTS SLITHER IN

SERPENTINE

Snakes have taken over planet Earth! Your mission is to make the planet safe again for human habitation.

You control a good snake who chases the evil snakes through a randomly created maze.

In order to eat the evil snakes you must first become larger than they are. To do this you gobble up all the eggs which have been laid by the nasty serpents.

JAWS WITH BITE!

SHARK ATTACK

You are thrown to the sharks by a bunch of bloodthirsty pirates short on a bit of mid ocean entertainment.

To give you a sporting chance of survival they provide you with an automatic net with which you must cover the visible ocean surface in an attempt to trap the sharks.

As if sharks were not enough to worry about there are also a number of giant octopi swimming about on the look-out for food. These sometimes provide a diversion for the sharks who will bite clean through one if it crosses their path.

Shark Attack is one of a new range of games for the VIC-20 from Slough-based Romik Software.

Also new on the bright yellow Romik label this month is a Scramble type game entitled

You can also grow fat on the occasional frog which hops about the screen. There is another good reason why you should eat the frogs — they also eat the eggs in the maze thus depriving you of the essential nourishment which will enable you to grow large enough to take on the other snakes.

If you cannot out-grow your opponents there is another way to tackle the evil serpents. Snook up behind them and nibble at their tails!

Serpentine is the latest game from South Croydon based Spider Software for the Apple 48K. The game comes on disc at £19.95.

Marsian Rander and a Multisound Synthesizer which turns your VIC into a music centre.

All three games run on the unexpanded VIC and cost £9.99 each.

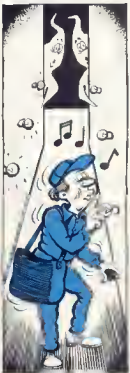
You'll be able to play anything from space themes to the latest pop hits with a little practical

ILLUMINATING EXPERIENCE IN A MAZE

SPECTORS

You'll be tumbling around in the dark in this latest — but novel — twist in the maze game theme.

You little man must illuminate the pitch black maze with light bulbs. He is pursued by ghosts



who chase him through the maze. There are also a number of generators dotted around the maze which, when your little man touches them, turn on the light bulbs and enable him to see the ghosts for a few seconds.

A new maze is presented when the current one has been completely filled with light bulbs.

Spectrum Sectors is the latest game from Liverpool based Bug-Byte for the Sinclair Spectrum, and it costs £5.50 inclusive.

DOWNPOUR OF AN ALIEN KIND

CLOUDBURST

Watch out for aliens jumping out of the clouds for they are not as friendly as they look.

Their aim is to colonise our planet, enslave its inhabitants, and savagely stamp out all resistance.

You must kill the evil little beasts before they lend in order to do this you will need a swift finger on the fire button, an accurate shot, and skilful manipulation of your gun — which is dome-mounted and can move through 45 degrees.

This facility is essential to your planets survival as you need to be able to shoot sideways as well as upwards to kill the aliens that have already landed and are making landings.

During their stealthy approach the aliens contain naked some of the rain clouds causing them to discharge intermittent downpours of radioactive rain.

They also brought with them an assortment of man eating spiders and giant insects.

This game may well remind the player of that ancient intergalactic proverb: "All that jumps from the clouds may not be a cute little alien with a big smile on his face."

Cloudburst is one of the new range of games from Audigenic for the VIC-20. The game comes on cartridge and plugs into the back of your Vic. It is available from the Reading based firm at £9.99.

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TAKING THE LID OFF

ELECTRONICS & COMPUTING MONTHLY is Britain's **FIRST** electronics and computer applications magazine which will help you enjoy your personal computer even more.

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New computer projects, superior software and educational articles make **ELECTRONICS & COMPUTING MONTHLY** required reading for serious home computer users.

Look inside the November issue, it's at your newsagent now.



Electronics & computing

1981

TV GAMES CENTRES TV GAMES CENTRES TV GAMES CENTRES VIDEO SCREEN

FIGHTING THE EVIL ZYLONS

STAR RAIDERS

Star Raiders puts you at the controls of an Atari Federation Starship hurtling through space at twice the speed of light.

The view from the cockpit is of deepest space with asteroids and stars streaking past you, in this version of the popular Atari computer game.

Your mission is to destroy all Zylon warships on sight.

Zylon fighters and cruisers can be destroyed by your photon torpedoes once they fly into your screen mounted sights.

But once you have shot down the defending star-fighters your mission becomes slightly more difficult.

You must destroy the Zylon headquarters. This is called the Basestar — and is well protected from attacking forces.

The Basestar is a little more difficult to destroy as it is protected by shields forcing you to risk the lives of your crew in an attempt to fly in and attack at close range.

The Starship is equipped with a number of sophisticated fight and battle information controls. The attack computer display shows you the position of the advancing enemy fleet.

The computer also keeps a running total of the number of Zylons downed — and those remaining.

Damage control informs you on the state of your own craft and the amount of energy you have left to carry on your attack on the enemy fleet.

The attack computer controls the sights — glowing red when a photon torpedo is timed accurately on an enemy target.

The game features a number of difficulty levels and a sophisticated scoring system which is based on the remaining energy when you have successfully destroyed all the Zylon invaders.

Star Raiders runs on an Atari VCS and will be in the shops from November at £29.95.



STDP THE ATOM PLANT GRDWING

REACTOR, AMIDAR

Atari owners can look forward to three new titles in the new year from Parker Video Games — the manufacturers of Frogger and The Empire Strikes Back.

Reactor traps you inside a nuclear reactor. Your mission is to stop the core from expanding which, if it gets much larger, will explode — spelling doom for millions of people. You can only stop this by blasting the control rods with nuclear particles causing the over expanding core to shrink.

Amidar is based on the popular arcade game of the same name. It is a simple task of collecting coconuts and painting lines. But watch out for the patrol guards — if you get boxed in you'll have to use your jump button to escape.

Super Cobra is a graphically

impressive version of the chopper attack game in which you must destroy the enemy base. You fly through a maze bombing the fuel dumps.

If you get beyond this stage then you will have to shoot it out with the UFOs that spiral towards you — moving at great speed from left to right across the screen.

The games will be in the shops from the end of January, priced at £29.95.

SHARKS WITH A BITE

NEW FROM APOLLO

The range of games now available for the Atari VCS is about to be widened still further with six new titles from America by Apollo.

Apollo will be the fourth independent company selling games in the UK for the Atari VCS.

Space Cavern challenges you to explore a cave on a planet lost in space time.

Space Chase is the classic galactic beetle where you shoot down rows of alien space craft.

MARCH OF THE DEADLY DEMONS...

DEMONS TO DIAMONDS

Demons to Diamonds challenges you to shoot down an army of dog-like demons who are marching towards you in this latest shooting gallery simulation game for the Atari VCS.

One or two players can play the game at the same time using Atari paddles to control your gun base.

Each player has to shoot only at a certain colour demons. If you accidentally hit one of your opponent's demons the little chap turns into a skull and starts taking pot shots at you.

When you hit one of your own demons it turns into a diamond and bounces from left to right across the screen advancing towards you before suddenly disappearing. Diamonds are worth extra bonus points if you can shoot one.

If you manage to shoot down eight screams the shooting skulls will begin to appear at random. After the tenth screen they begin to move, becoming more difficult to hit and getting faster with each screen.

Demons to Diamonds is due for release in October and will be one of the less expensive new games this Christmas at £18.95.

Snake Attack is Apollo's answer to Pacman in this development of the maze theme you control a dove who swims along collecting diamonds.

There is also a two player squash game called Skunk Run in which you shoot clay pigeons on your TV set.

The Apollo range of games are distributed by Vulcan Electronics.

The games cost £24.95 except for Skunk Run which is a little cheaper at £19.95.

CENTRES TV GAMES CENTRES TV GAMES CENTRES VIDEO SCREEN



BECOME A WHIRLYBIRD WIZARD!

CHOPPER COMMAND

Chopper Command is the latest addition to the Activision range imported into this country by Computer Games Limited.

The game is well known in the States where the manufacturers look out whole pages in games magazines to advertise the cassette.

The basic task is to defend a convoy of medical supplies as they journey through the desert.

On your journey you are attacked by enemy jet fighters and guided missiles.

You have the aid of radar which represents the oncoming aircraft as a series of white dots on the horizon and you are a black dot.

You must constantly keep an eye on the radar so that you are well positioned to pick off the enemy aircraft before they can penetrate your defences and get at those vital medical supplies.

Chopper Command has impressive graphics, the desert being represented as deep glowing orange.

The chopper itself is a detailed simulation in yellow with the trucks black silhouettes.

Chopper Command runs on an Atari VCS and will be in the shops at £24.95 in late October.

FIND THE ULTIMATE ANSWER . . .

RIDDLE OF THE SPHINX

Riddle of the Sphinx offers you a unique video games challenge, combining an adventure format puzzle with a reaction firing test.

If you discover the meaning of the riddle you could be the first person to do so. Although it has been released in the U.S. no-one has yet solved it.

On your journey you will have to do battle with fierce tribesmen armed with spears and knives. These battles not only put you in mortal peril they also force you to use up your precious water.

As your water runs out you slow down until — unless you find an oasis — you will die of thirst.

You move your desert traveller with the joystick, left and right as the scenery of the desert scrolls down past you.

The aim of the game is to collect as many diamonds and baskets of treasure as you can on your apparently nonsensical trail through the desert in the ultimate pursuit of the answer to the Riddle of the Sphinx.

You also encounter some good characters on your journey — among them a beautiful maiden.

Can this be a clue to the Riddle of the Sphinx? The game is one of the Imagic range, distributed in the UK by Adam Imports and will be in the shops before Christmas at £27.95. It runs on an Atari VCS.



Illustration: Terry Rogers

DICE CALL THE TUNE

BACKGAMMON, DRAUGHTS

Backgammon and Draughts are the two new titles offered in time for Christmas for the Videomax Database TV games centre.

The Backgammon cassette features a number of games at different levels of difficulty. The first teaches you how to play the game in easy to understand stages.

The dice are rolled automatically by the machine and change colour from blue to red to indicate which player's turn it is — or to indicate that it is the computers turn if you are playing alone.

The Draughts cassette also features several different versions.

You can play against a friend or take on the computer at one of three different skill levels.

For people who like to do things backwards the game will also allow you to play a reverse version of draughts in which the idea of the game is to get rid of all your men before your opponent.

Backgammon and Draughts will be available at Videomax dealers from October at £19.95 each.



DEALING WITH DEADLY DISCS

NEW FROM INTELLIVISION

Mattel are about to attack the Christmas TV games centre market with a number of new releases for the Intellivision machine.

The long awaited Tron games — featured in **Computer and Video Games** last month — Deadly Discs and Tron Maze-A-Tron are due in the shops in October.

In Deadly Discs you do battle with a variety of computer controlled adversaries — armed only with an electronic freezebe.

In Maze-A-Tron you have to penetrate the Master Control Program. But beware the nasty monsters sent out to thwart you.

Mattel are also offering a choice of two free games when you purchase an Intellivision machine. You can have a copy of Lock 'n' Chase — Mattel's answer to Pacman or their soccer simulation game.

Dungeons and Dragons will be in the shops from November and is a version of the popular role playing fantasy game in which

DISCS

you have to find your way around a maze of caverns and tunnels and win treasure.

Also new from Intellivision is card playing simulation on cassette Royal Dealer offers a choice of four different games. You can choose to play against one, two, or three different computerised opponents. The game does not just display the different hands but actually shows you your opponents sitting around a table. The game also acts as a score keeper.

Intellivision cartridges can be obtained from your local Mattel dealer at between £19 and £24.

The new Dragon 32. So well designed, you'll even understand this ad.

If you're already a computer expert, may we refer you to the box of technical specifications displayed opposite.

If you're not, may we refer you to the new Dragon 32 Family Computer. A computer so easy to understand, you won't understand why all the others seem so difficult.

And the new Dragon 32 costs under £200.

32K RAM FOR UNDER £200?*

When you're comparing computers, the first thing you need to know is the size of the memory. In plain English, the Dragon has approximately 32 thousand units of Random Access Memory. (32K RAM for those who prefer to be blinded by science.) This means that the Dragon's memory is at least twice as powerful as its competitors.

With a memory this powerful, the amount of information the Dragon can store is literally vast. But the Dragon doesn't just make it easy to store information. It makes it easy to use, too.

USER-FRIENDLY?

You may have heard of the term 'user-friendly.' Reverting to plain English once more, this means simply that the computer will go out of its way to understand you, rather than vice-versa.

The Dragon 32 is so user-friendly, it practically licks your hand.

You tap (literally) its vast resources through a beautifully-designed keyboard that's as easy to use as a typewriter.

On this keyboard, you type in a language which is surprisingly close to the English you talk every day. The Dragon 32 will receive your order. Understand it. Send it to the appropriate section of its massive brain. And then display the appropriate information on your screen. All before you can say 'gobbledygook.'



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EXTENDED MICROSOFT COLOUR BASIC (as standard). Featuring ADVANCED GRAPHICS (set, line, circle, paint, print, draw, rotate and print using) ADVANCED SOUND 5 octaves, 255 tones AUTOMATIC CASSETTE RECORDER CONTROL. FULL EDITING with INSERT and DELETE.	
9 COLOUR, 5 RESOLUTION DISPLAY	
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PRINTER (Centronics parallel).	
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And it's clever enough to create virtually any image you want - circles and arcs as well as straight lines.

The Dragon will also play and compose music with you, with a range of 5 octaves. And it works with any UHF TV or PAL monitor.

LEARNING THROUGH PLAYING.

All of this makes the Dragon the ideal machine to build your children's interest in the world of computers as they become increasingly more vital. School-children already enjoy using computers.

The Dragon is the first computer specifically for the family - so by enjoying yourselves at home, you and your children can soon become expert enough to create your own programs.

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EXTENDED MICROSOFT BASIC AS STANDARD	YES	NO	NO	NO	NO	NO
PROFESSIONAL-TYPE KEYBOARD	YES	NO	YES	YES	YES	YES

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It is ironic that one of mankind's most practical and logical 20th Century tools should provide so many opportunities for fantastic and historic escapism. Many computer games indulge us in our quests for myths and legends on exotic planets and more romantic eras. We asked Mark Blundell of computer moderated gaming company, Mitre Wergames, to explain how to map out computer controlled worlds and times as the fabric for a fantasy game.

BUILDING A COMPUTER WORLD

BY MARK BLUNDELL



Illustration: Jan Davis

A hot, dusty afternoon. The crowd was impatient, chanting and jeering, when suddenly there was hush: two tough, wiry figures strode into the arena, armed and ready for combat.

The tension broke, and wild cheers rang out — some for one, some for the other. Who will triumph in this deadly tussle of strength, wits and fortune? The Gladiator combat has begun.

You may remember reading about computer-moderated play-by-mail games in May's issue of *Computer & Video Games*.

A new addition to this field is *Gladiator* which is particularly close to our hearts, being not only British, but also entirely our own creation. I have set down here the background to the game, for those of you who are interested in play-by-mail (P.B.M.) games or who are thinking of creating one of your own.

One advantage of computer moderated games is that a large number of players can have their moves processed quickly and cheaply. It can also cater for complicated interaction between rival players without deluging them with extensive rules or requiring detailed analysis of a player's movements.

Lastly the computer acts as an unbiased and unmovable authority on the interpretation of the rules and how they are carried out. The biggest drawback is lack of flexibility as the programmer is unlikely to predict every possible develop-

ment of the game he has created.

When we first developed *Gladiator* we tried to produce a game which made the most of the computer's strengths.

Having established the need for the game, we looked for a suitable subject, one which readily lent itself to computerisation. Many ideas were considered before we decided on the excitement of combat in the ancient arena as the ideal choice. In the system we have developed for *Gladiator* there are a limited number of variables, all interacting to produce results — the prime requisite for a computer-moderated game.

Gladiator meshes in very well with one of our existing games, *The Tribes of Crane*, so that players from there provide a basic nucleus for the game, giving a full number of gladiators eager for combat from the very start.

For a game set in the sword-to-sword combat of the arena, we clearly needed a blow-by-blow description of the fight and of the moments when the telling strokes were made. To generate this, we would need to input a number of variables supplied by the player, and let the computer "play" with them according to a suitable program to generate the result. Variables such as these are an essential ingredient of any computer-moderated game.

In the arena we decided that

there would be three broad categories of variable: the ability of the gladiator; his tactics; and luck. We allocated these groupings to the three types of variable we wanted to input into the program.

First, there were variables which were constant for each individual gladiator in all of his fights: his experience, special skills, and so on.

Second, factors that varied for each gladiator, fight by fight — choices of tactics, special weapons or special plans. Finally, there are variables generated by the computer itself — the inevitable random element.

As all of our other games are role-playing games, where the player assumes the persona of a tribal chief or planet ruler, we naturally felt that the character of the *Gladiator* should be important. The whole of a player's first turn is spent in creating his fighter.

The player has a number of points which he can allocate to the various attributes of the warrior, like strength, speed and intelligence.

This choice is crucial as each attribute will have a different effect on each of the different kinds of stroke available to the gladiator in all his fights.

Tactics are devised by the player for each individual fight in which his gladiator participates. There are six basic strokes from which to choose,

and the wise gladiator will concentrate on those where his natural abilities are most powerful.

The opponent's previous fights will be studied, in order to plan the best tactics against him. 30 consecutive strokes are chosen on the turn sheet, and these are processed in order by the computer, simultaneously with the strokes of the opponent.

The gladiator's basic details — his main attributes and special abilities — are input when the gladiator is first set up, and stored on a floppy disc. Whenever a turn for that gladiator is processed, the tactics he has chosen are input and the attributes recalled from the disc.

These attributes are then used to modify the percentage chance of scoring a hit with the tactics chosen. This modification system is the core of the program. Graphs were drawn to show the shape of the effect which we wished each attribute to have as its strength (the points allocated to it by the player) varied, and then functions were devised to achieve the desired patterns.

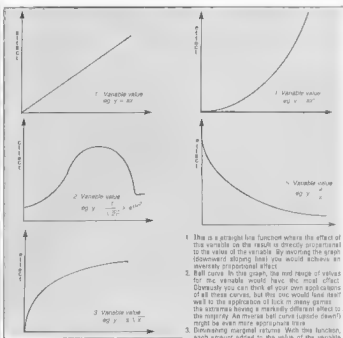
The gladiator's attributes are compared with those of his opponent to determine the chance of hitting on any particular stroke for each gladiator. This involves cross-referencing the two strokes with each other, as there is a matrix for the chances which different strokes have against one another.

Random numbers are then generated by the computer and compared to the modified base percentage chance of a hit to see if one has actually been achieved. This is the luck element.

If you decide to devise your own game, the functions and algorithms which are the core of any game program, should have considerable thought devoted to them.

The way in which you want each variable to affect the result is crucial. I have shown some examples of functions (above) but there are obviously many others, as well as other variations of these, which can be devised to give an infinite range of effects. You may need to talk to a friendly mathematician to turn the graph or diagram into an algorithm the computer can use.

One last important consideration is the gradient or slope of these functions. These will determine precisely how much each change in value of the variable alters the effect it has on the result. These are crucial to play-balance and the only



way to achieve a good balance is through rigorous play-testing.

It may sound dry stuff but this is the crux of the game and the most exciting part of seeing your creation come to life is seeing how the algorithms respond to a set of circumstances and then tuning them to achieve believable results.

Don't make the mistake of choosing an all-powerful tactic which will win no matter what, players will quickly find it. Instead produce a matrix where the tactics entered by either side are compared and the results taken into account when finalising the outcome.

A simple matrix of the sort used in World Cup Manager (C&VG June) is also illustrated above.

To add to the personality and excitement of the game various wrinkles and tweaks should be added to the basic algorithms. In Gladiator, for example, the combatants may elect to begin with a spear cast before closing in or can fight to the death instead of just until first blood is drawn.

In the army chieftain type of P.B.M. it is possible to account for such things as lowering morale following a defeat or a long route march.

In individual games like Gladiator exhaustion during a fight is catered for, as the combat draws on the fighters become more vulnerable

- 1 This is a straight line function where the effect of the variable on the result is directly proportional to the value of the variable. By inverting the graph (downward sloping line) you would achieve an inversely proportional effect.
- 2 Bell curve. In this graph, the mid range of values for the variable would have the most effect. Obviously you can think of your own applications of all these curves, but this one would lend itself well to the application of luck in many games. The extremes having a markedly different effect to the majority. An inverse bell curve (upside down) might be even more appropriate here.
- 3 Diminishing marginal returns. With this function, each amount added to the value of the variable has less effect than the previous one. A useful function in the allocation of scarce resources if you feel they should be evenly spread between variables.
- 4 Increased marginal returns. This function is the inverse 3. Here each increase in the value of the variable produces a greater effect than the previous one. Here you would be encouraging a greater divergence of values in variables and more varied results.
- 5 This graph shows the mirror image of 4. Here each increase in the variable produces a smaller effect on the result than the previous one. It produces a lesser decrease than the previous one.

ATTACK TACTICS			
	Fert	Early	Slow
DEFENCE TACTICS	Break	Cross	Build-up
Shadow Attacks	15%	30%	5%
Intercept Passes	30%	5%	15%
Use a sweeper	5%	15%	30%

6 A simple matrix from World Cup Manager where the percentages indicate how team tactics influence a scoring chance in this particular situation. So playing a sweeper proves the best defence against a fast break.

and less effective. Can they summon up those extra reserves of strength to deliver that crucial blow.

Often disregarded by the amateur who gets bogged down in computer code is the presentation of the game. Writing up games rules in an easy-to-follow, and unambiguous way is part-and-parcel of producing a good game. If you are asking players to fit into a world of your making then you must bring that world to life for them.

Don't skimp over the rules you had to compromise your ideals on, every part of the game should be fitted into the context of the world and the rules and customs by which it works.

Mitre Wargames is based at Lotheron, Stockdale, Healdens in Bucks

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MADE IN
ENGLAND

CHESS



A common myth — particularly among non-players — is that grandmasters look at every possible variation for many moves ahead. A little calculation reveals that this must be false.

Suppose each side had 10 legal moves at every turn, then to look ahead three moves for each side would involve considering a million positions. A grandmaster may well need to look ahead at least 6 or 7 moves for each side during the course of a game and cannot possibly process all the necessary positions in the time allowed.

In any case there is no evidence that they even attempt to do so.

There is a famous remark attributed to the grandmaster Reti. When asked how many moves he saw ahead, Reti is alleged to have replied: "only one move — the right one".

The Dutch psychologist Adriaan de Groot made a study of what factors determined chess skill in the 1930s and 1940s and published his findings in a classic work *Thought and Choice in Chess*. To do justice to this book would require many articles, but a few examples will give the flavour of the work.

In one experiment, de Groot showed a series of unfamiliar positions to chess players at all levels of skill from world championship level (Alekhine, Keres and Euwe were all included) to club players.

Each player's task was to choose a move and think out loud while doing so.

De Groot recorded their verbal statements and used them to estimate how much searching each player carried out in finding a move. Figure 1 shows one of de Groot's positions, with White to play. You may like to try it yourself before reading on.

The results cast an interesting light on grandmaster skill particularly in relation to the nearest group of lesser players, designated as "experts".

There were five grandmasters tested and four of them chose the correct move in Figure 1. None of the five experts tested picked it

Why can't a computer think like a man? Even the best chess-playing machines searching huge trees of variations have still not reached master standard and only a few are good enough to trouble the strongest amateur human player.

Might it not be better to approach the problem another way — how do grandmasters think?

All the grandmasters mentioned the correct move at some point in their analysis, but only 2 of the 5 "experts" did.

Measurements of time taken to make a decision, number of moves considered etc. did not convincingly differentiate the two groups, with one exception: the "value" they estimated for the chosen move where the grandmasters were much more accurate.

Revealing the average depth of search for both grandmaster and "expert" on Figure 1 was much less than some might have expected, a relatively humble seven ply — four moves for White and three for Black.



The "millions" of variations supposedly explored had also shrunk to an average of 35 moves in total. It seems clear that the grandmasters were able to perceive some feature of Figure 1 which the experts could not, even though they were able to analyse just as well in every measurable way.

In case you have not yet found the correct move, it is BxN(Q5).

A second experiment reinforced and clarified the importance of perception in chess. This time de Groot again permitted his subjects to look at a position again permitted his subjects to look at a position

from an unfamiliar game, but only for a few seconds.

The task was then to recall the position, for example by setting it up on an empty board.

The results of this experiment were intriguing, grandmasters and masters recalled approximately 93% of pieces correctly, experts recalled 72% and lower-level players recalled about 51%.

However, when the same experiment was repeated with randomised — possibly illegal — positions of pieces, the grandmasters' advantage vanished.

All the subjects performed equally badly, recalling only 3 or 4 pieces correctly.

It is reasonable to deduce that on the former task (recalling "genuine" positions), the grandmasters were recalling not individual disjoint piece positions, but clusters of pieces or significant patterns.

To illustrate this, consider Figure 1 again — although it was not, in fact, one of the positions used in the second experiment.

A cursory inspection shows a King-side castled formation for both sides, Queen Rooks opposed on an open file, two knights on "Bishop 3", an isolated Queen Pawn on Q4 supporting a White Knight on K5 and blockaded by a Black Knight on Q4.

There is a White Bishop on KN5 pinning the Knight on Black's KB3 which is defended by a Bishop on K2. Black has a fianchettoed Bishop pawn formation (KB2, KN3, KR2) although his King's Bishop is out of place.

These are all features which occur in unnumberable positions, but would not be recognised by the beginner — or the computer.

Where does all this leave us? Grandmasters seem to analyse no better than experts, but recognise more features of a position which somehow prompt them to find good moves.

How many features are there altogether? If we could identify them and put them into a program, would we have a "grandmaster program"? I will return to this topic next month.

BY MAX BRAMER

MAL FUNCTION

T. HITCH

SNAG JNR

SCREAMING FOUL UP

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ON OCTOBER 31ST

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KNOCK!

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TO GET INTO NEW
TECHNOLOGY...

IT'S ABOUT THAT
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WELL I COULD
REALLY DO WITH
SOME DISC DRIVES...

SHRIEK!!!

CHOMP!

KEY LIFTED
OPEN!

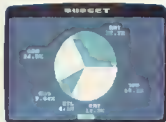




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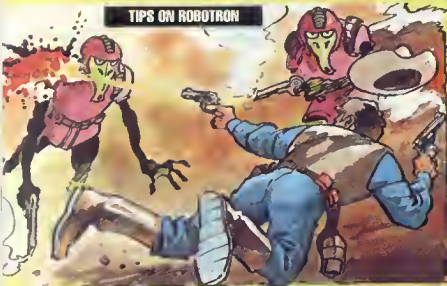
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COMPUTER & VIDEO GAMES 89

TIPS ON ROBOTRON



Arade games don't come any more forbidding than Robotron. To the uninitiated, the screen appears as a chaotic whirr of activity—add the unfamiliar two joystick control and the odds seem impossible.

The game is the invention of former Williams game designer Eugene Jarvis, who was responsible for Defender.

Robotron sets you down in a screen full of rampaging robots with the task of saving the man, woman and child clones. These clones are the way to large scores, the first one you save is worth 1,000 points, the second 2,000 and so on up to 5,000.

The early walls are deceptively easy and should be used to become acclimated to the controls. The left joystick moves the player in eight directions, the right enables the player to fire in eight directions. Practise moving and firing diagonally.

Wave one introduces you to the Grunt, your first robotic foe (100 points) are the cannon fodder in Robotron. They wander around but cannot fire and you should ensure that the two clones on this screen are rescued before you destroy the first Grunt. Finishing off all the Grunts and the wave.

Wave two brings on the indestructible Hulks which can be helied by a hit but will kill the

A BRAIN WAVE OF A GAME

Spheroids (1,000 points) are the main priority on this wave. They lay Enforcers (200 points) which look rather like fire hydrants and spray out fire at you. Stay out of the way of the Hulks, blast the Spheroids and Enforcers, then finish off the Grunts and scoop up the humanoid clones before the Hulks kill them.

The third and fourth (and sixth and eighth) waves feature the

same loss but there are inevitably more of them and they become more aggressive. Spheroids often start in corners and are vulnerable to the player who has mastered diagonal fire from the centre of the screen.

Wave five is known as the Brainwave. The Brains are particularly dangerous as they can turn your clones against you and fire deadly cruise missiles which track your man.

First priority is to eliminate the single Spheroid and then blast the Brains quickly for 500 points each. Cruise missiles can be run

from when there is more than one of them. They will chase you but soon fall into an easily blastable line behind you, turn and fire.

When Brains find a clone they jump them up and down and turn them into deadly Progs. These are then fired at you and you have to react quickly to escape.

Wave seven introduces the Tanks (300 points). These start like blue spirals, Quarks, which sit passively on the screen. Don't be misled, these should be blasted as quickly as possible. You won't get all the Quarks but try to single out those which are developing for quick attention. Fully formed Tanks will fire cannonballs at you, which can rebound off walls to get you from behind.

Wave nine is given over to Grunts, blast your way quickly through to a wall and then tackle the Enforcers.

Brains reappear on the 10th, 15th and 20th wave and wave 22 brings in a deadly combination of Tanks and Enforcers and after wave 40 it starts up all over again.

It is possible to blast your way out of very tight corners by using the old Asteroids technique of moving and firing towards the enemy. Don't let the corner-loving Enforcers trap you in one and keep the Hulks away from your main source of points, the clones.

Different operators set different bonus life levels so shop around for five lives and a bonus every 12,000 to learn on.

ARCADE MISS IS A HIT

Ms Pacman, the first lady of the American arcades, is to make her debut in the U.K.

We featured this female of the carnivorous movie species in an article on the arcade industry's assault on women players.

Most British distributors have fought shy of introducing this lady to our shores, but now a "conversion" kit is out and don't be too surprised if the Pacman in your local pub or arcade develops curling eye-lashes and takes to wearing a bow.

Apart from these understandable additions to her appearance, Ms Pacman will also feature four mazes for the newcomer to try his hand at. Three of

MS PACMAN

these have an additional two side exits.

Dots still score 10 points each with energizers adding 50 to the total. As with the usual Pacman, Ms Pacman munches 200 points on the first ghost, 400 for the second and so on.

When she is caught, Ms Pacman dramatically swoons and falls and the clichés don't stop there, the between screen displays feature Pacman chasing the new Ms across the screen, then she chases him and finally the delivery of the Pac-baby.



The ghosts are still as you remember them, except that one of these has now undergone a sex change operation and is affectionately known as Sue.

THE LOST ARC OF THE COSMOS

The search for cosmic treasures takes place in Space Dungeon, a new game which is being tried out at a few locations in Britain.

Space Dungeon uses the Robotron design: a two joystick control for moving around the screen and eight-way fire.

You play the part of a rider who can penetrate the cosmos to discover its riches. A radar screen helps to plan your tactics and manoeuvres as you try to evade the guards and other

SPACE DUNGEON

thieves to grab the treasures and follow the arrows to the Bonus Room.

Points for collected treasure are scored only after a level of the dungeon is completely explored. Each level, of a possible 90, has 16 treasures and 36 rooms. The deeper the dungeon, the player strikes the more valuable the treasure but the greater the danger.

The main rival for the treasures is the Thief who will steal away your bounty. A direct hit will make him drop it. Watch out!

OUTLINE

DON'T STEP OUT OF LINE

Try to outwit the Outline machine. You can never win but you can achieve a good draw.

Outline is a chase game on a series of changing grids. You control a drawing marker which runs along the lines of the grid, responding to a simple joystick control. Behind you comes the cheater leaving his own marking across the grid pattern.

You can keep him at a distance by employing a gap button to prevent him catching you. Like Amidar, the screen colours in every square successfully surrounded by your lines.

When the cheater is left behind a gap he must retrace his tracks and find another route to get to your marker or wait until the gap closes again.

If he doesn't catch you and the screen is filled in, you can progress to a new grid pattern. You can start at different levels of difficulty and it is possible to have more than one chaser after you.

In the later stages you will find the machine talking to you and the chasers are equipped with missiles to fire after you.

One trap a lot of beginners fall into is, being cut off at a corner between two of their own gap barriers. A mistakenly pushed gap button leaves you helpless while the chaser waits patiently for the gap barrier to clear.

for the hovering Spore Case, a hit on this will result in a frenzy of deadly Spores attacking you.

If you lose a life, your treasure is shown on the radar screen and can be returned to later.

The treasures are: iron crosses, copper pieces, silver stars, a golden fleece and a platinum ark. Among the dangers are an Executioner, the Enforcer, Death Squares, Guards, Pike Ships and a mysterious creature called a Corner Zepper.

Like Tempest, Space Dungeon lets you enter the game at a level suited to your skills; you can inflict untold damage on the easy levels or go for a more dangerous level with the increased rewards it brings — but, of course, more risks.

The graphics in the game are not realistic but have a symbolic design and the signs are that Space Dungeon is proving popular enough for more widespread distribution soon.



Can you become a pinball Mastermind? That's the challenge issued by the latest machine from Bally — called Spectrum.

You have to crack the colour code set up by the pin's built-in computer brain while you play. You must hit targets to light up coloured lights in the correct order. If you crack the table's code — it can choose from 256 combinations — you win a big bonus. If you manage to get your ball into one of the three kick-out holes featured on the playfield the machine will give you a clue — indicating which target lights you should aim for.

A novel feature of this particular pin is that the ball is fired onto the playfield using the right-hand flipper button.

It's a table that will keep you guessing.

Also new from the Bally stable this month is Speakeasy — a return to good old fashioned pinball concepts. It has a card game theme — traditional in pinball — and includes Add-a-Ball and Subtract-a-Ball features. It also has a roulette wheel on the playfield which spins each time you lose a ball, giving bonuses

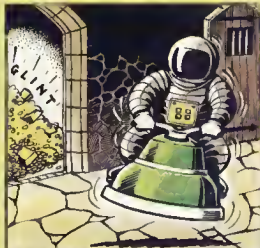


Illustration: Terry Angles

RECORD BREAKERS

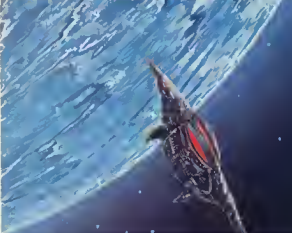
A whole host of new machines are making an appearance on Record Breakers for the first time.

We have also received a good deal of correspondence about an older machine, Defender, from people who regularly score over a million. The reason Defender

was not included is that some players can now continue playing for as long as the arcades remain open.

The Battle Zone and Missile Command games are also going this way and I am closing the file on these.

TEMPEST 486,481 Richard Hull	DONKEY KONG 423,200 John Ball	PACMAN 1,050,900 Tim Hayward
SCRAMBLE 371,458 M. Cotton	DIG DUG 581,438 Stephen Broadhead	CENTIPED 908,000 Chris Coton
BORG 586,830 Chris Murray	QIX 283,828 Sashit Singh	HYPERBALL 1,443,800 Nick Blackings
PROGGER 67,900 Denny Blackmore	CRUSH ROLLER 471,830 Alan Dawber	HYDROX 495,830 John Dunsford



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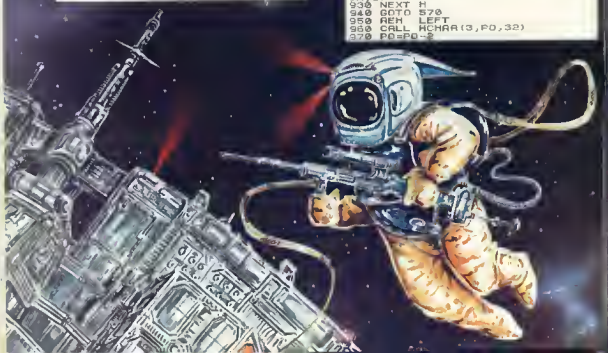
100 CALL SCREEN(2)
110 CALL CLEAR
120 REM *****SPACE LASER*****
130 REM ***BY GM PROGRAMS***
140 REM *****
150 RANDOMIZE
160 SD=1000
170 X=0
180 LAS=3
190 FUEL=32
200 AC=500
210 KS="BRASS=" & STR$(LAS)
220 FOR Y=1 TO LEN(KS)
230 CALL MCHAR(1,22,Y,ASC(SEG$
  (KS,Y,1)))
240 CALL SOUND(1-5*Y)
250 NEXT Y
260 FOR CHAN=1 TO 8
270 CALL COLOR(CHAN,7,1)
280 NEXT CHAN
290 CALL MCHAR(AC,1,132,32)
300 US=INT (FND*14)+2+4
310 X=32
320 CU=INT (RND*16)+5
330 CALL MCHAR(CU,1,136)
340 FOR A=1 TO 30
350 CALL MCHAR(RND*20+1,FND*30+
  120)
360 NEXT A
370 CX=INT (RND*22)+4
380 NH=23
390 PO=INT (FND*12)+2-5

```

```

400 CALL CHAR(46,7E2E5C5C101600
  00")
410 CALL CHAR(104,1010101010101
  010")
420 CALL CHAR(112,00001630663C1
  800")
430 CALL CHAR(136,EEEEEEEEEEEE
  EEE")
440 CALL CHAR(120,"1")
450 CALL CHAR(128,"FE1EFE1EFE1EF
  E1E")
460 CALL CHAR(144,"F3F4500C5E3F
  207")
470 CALL CHAR(152,"FFFFFFFFFFFF
  FFF")
480 CALL COLOR(9,14,1)
490 CALL COLOR(15,7,11)
500 CALL COLOR(16,2,2)
510 CALL COLOR(14,11,1)
520 CALL COLOR(10,10,1)
530 CALL COLOR(13,7,1)
540 CALL COLOR(11,5,1)
550 CALL MCHAR(24,1,128,32)
560 CALL MCHAR(3,PO,96)
570 CALL MCHAR(INH,CX,32)
580 NH=NH-1
590 IF INT (RND*2)=1 THEN 1030 E
  LSE 1050
600 IF NH=1 THEN 1070
610 IF CX=2 THEN 1250
620 IF CX=30 THEN 1270
630 CALL MCHAR(INH,CX,112)
640 F=INT (RND*15)+1
650 CALL COLOR(12,F,1)
660 CALL KEY(0,K,5)
670 IF K=32 THEN 710
680 IF K=83 THEN 950
690 IF K=85 THEN 990
700 GOTO 570
710 IF NH=2 THEN 1070
720 CALL MCHAR(4,PO,104,NH-3)
730 CALL SOUND(1-100,4000,0)
740 X=X+2
750 IF X=10 THEN 1710
770 CALL MCHAR(4,PO,32,NH-3)
780 CALL MCHAR(24,1,152,32-X)
785 IF X=0 THEN 2080
790 IF CX=PO THEN 820
800 IF PO=US THEN 1480
810 GOTO 570
820 CALL SOUND(1000,-5,1,110,5)
830 CALL MCHAR(NH,CX,144,2)
840 CALL MCHAR(NH,CX,32,2)
850 CALL MCHAR(NH+1,CX,144,2)
860 CALL MCHAR(NH+1,CX,32,2)
870 CX=INT (RND*25)+4
880 NH=23
890 SC=SC+28,88
900 CS="SCORE=" & STR$(SC)
910 FOR H=1 TO LEN(CS)
920 CALL MCHAR(1,2+H,ASC(SEG$(CS
  ,H,1)))
930 NEXT H
940 GOTO 570
950 REM LEFT
960 CALL MCHAR(3,PO,32)
970 PO=PO-2

```



SPACE LASER

```

900 GOTO 560
900 REM RIGHT
1000 CALL HCHAR (3,PO,32)
1010 PO=PO+2
1020 GOTO 560
1030 CX=CX+INT (RND*3)
1040 GOTO 600
1050 CX=CX-INT (RND*3)
1060 GOTO 600
1070 XU=XU+1
1080 IF XU<3 THEN 1790
1090 CALL SOUND (100,110,0)
1100 U$=" G A M E O V E R "
1110 FOR A=1 TO LEN (U$)
1120 CALL SOUND (100,294,0)
1130 CALL HCHAR (12,3+A,ASC (SEG$ (
U$,A)))
1140 CALL SOUND (100,330,0)
1150 NEXT A
1160 CALL SOUND (1100,110,0,4000,
2)
1170 BNS="YOUR SCORE IS" & STAS (SC)
1180 FOR A=1 TO LEN (BNS)
1190 CALL HCHAR (16,6+A,ASC (SEG$ (
BNS,A)))
1200 NEXT A
1210 IF X=0 THEN 1670
1220 IF SC<593.63 THEN 1360
1230 GOTO 1290
1240 STOP
1250 CX=CX+1
1260 GOTO 6200
1270 CX=CX-1
1280 GOTO 6200

```

```

1290 PRINT " P L A Y A G A I N "
1300 CALL KEY (0,K1,51)
1310 KL=KL+1
1320 IF KL=500 THEN 1240
1330 IF K1=0 THEN 1300
1340 IF K1=32 THEN 1350 ELSE 1300
1350 SC=0
1355 KL=0
1360 GOTO 100
1370 STOP
1380 PRINT " ** BONUS GAME "
1390 CALL CHAR (112,"103C7EFFF103C
5899")
1400 CALL SOUND (100,262,0)
1410 CALL SOUND (100,524,0)
1420 CALL SOUND (100,392,0)
1430 CALL SOUND (100,440,0)
1440 CALL SOUND (100,549,0)
1450 CALL SOUND (1000,110,0,-5,0
4000,6,500,0)
1460 SC=0
1470 GOTO 100
1480 CALL SOUND (1000,-1,0)
1490 X=32
1500 FUEL=FUEL-1
1510 CALL HCHAR (24,FUEL,120)
1520 RD=RD+10
1530 CALL SOUND (-50,RD,0)
1540 IF FUEL=1 THEN 1550 ELSE 15
00
1550 SC=SC+167.45
1560 FOR DOUN=CU TO 20
1570 CALL HCHAR (DOWN,UB 135)
1580 CALL SOUND (1,SD,0)
1590 SD=SD-50

```

```

1600 CALL HCHAR (DOWN,UB 32)
1610 NEXT DOWN
1620 VS=0
1630 CALL CHAR (112,"FF106C7EFFFF
5899")
1640 CALL CHAR (96,"AAFF7EFFFF816
5B19")
1650 CALL CHAR (104,"816181618181
8161")
1660 GOTO 900
1670 CALL SOUND (1000,500,0)
1680 CALL SOUND (1000,1000,0)
1690 PRINT " * OUT OF FUEL * "
1700 GOTO 1290
1710 FOR O=F TO 16
1720 CALL COLOR (13,0,0)
1730 CALL SOUND (1,-1,0)
1740 CALL SOUND (1,-2,0)
1750 NEXT O
1760 CALL COLOR (13,7,1)
1770 GOTO 770
1780 STOP
1790 CALL HCHAR (NH,CX,32)
1800 CALL VCHAR (4,PO,32,NM)
1810 IF XU>2 THEN 1090
1820 NH=23
1830 FOR SO=1000 TO 900 STEP -5
1840 CALL SOUND (-50,SO,0)
1850 NEXT SO
1860 U=32
1870 JK=500
1880 CALL HCHAR (24,U,120)
1890 CALL SOUND (-50,JK,0)
1900 JK=JK+10
1910 U=U-1
1920 IF W=0 THEN 1930 ELSE 1880
1930 X=32
1940 LAS=LAS-1
1950 KS="BASES=" & STAS (LAS)
1960 FOR Y=1 TO LEN (KS)
1970 CALL HCHAR (1,Y+22,ASC (SEG$ (
KS,Y)))
1980 NEXT Y
1990 CALL SOUND (10,-3,0)
2000 GOTO 600
2010 STOP
2020 U=32
2030 CALL HCHAR (24,U,120)
2040 U=U-1
2050 IF U=0 THEN 2060 ELSE 2030
2060 X=32
2070 GOTO 670
2080 IF XU<3 THEN 2090 ELSE 1100
2090 XU=XU+1
2100 GOTO 1790
2110 END

```

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11 PRINT TAB( 10)** ICE CREAM **
12 PRINT TAB( 10)** VENDORS **
13 PRINT TAB( 10)** G.W.GALLAGHER **
14 PRINT TAB( 10)** 1980 **
15 PRINT TAB( 10)** *****
16 PRINT TAB( 10)**
17 PRINT TAB( 10)**
18 PRINT TAB( 10)**
19 FOR I = 1 TO 2000: NEXT I
20 DIM MS(4),RC(4),RR(4),RL(4)
70 DIM GA(4),GD(4),GE(4)
75 DIM GA(4),TAK(4),PRO(4),A(4),C(4)
80 DIM CST(4),S(4),E(4),L(4)
90 DIM DA(4),PB(4),PE(4),PD(4)
92 DIM PA(4),PB(4),PE(4),PD(4)
95 GOTO 2100
100 PRINT "PRESS SPACE BAR WHEN YOU ARE READY TO CONTINUE"
110 GET AS: IF AS = ** THEN GOTO 110
120 RETURN
200 FOR I = 1 TO V: IF A(I) - 9 < 1 THEN P(A) = 1: GOTO 240
210 IF A(I) - 9 < 3 THEN PA(I) = *: GOTO 240
220 IF A(I) - 9 < 6 THEN PA(I) = *: GOTO 240
230 IF A(I) - 9 < 10 THEN PA(I) = *: GOTO 240
250 IF A(I) - 9 < 10 THEN PA(I) = *: GOTO 240
    
```

RUNS ON AN APPLE

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BY G. W. GALLAGHER

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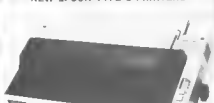
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ICE CREAM VENDOR

```

2430 INPUT CH(K): IF CH(K) = .1 < * X(K) THEN GOTO 2438
2435 GOSUB 800: PRINT : GOTO 2430
2438 X(K) = X(K) - CH(K) * .1: GOSUB 400
2439 PRINT "CASH IN HAND * X(K):" POUNDS": PRINT
2440 PRINT "HOW MANY LOLLIES AT 5 PENCE EACH": PRINT
2450 INPUT L(K): IF L(K) = .05 < * X(K) THEN GOTO 2458
2455 GOSUB 800: PRINT : GOTO 2450
2458 K(K) = X(K) - L(K) * .05: GOSUB 600
2459 PRINT "CASH IN HAND * X(K):" POUNDS": PRINT
2470 PRINT : PRINT : PRINT "DO YOU WISH TO CHANGE ANYTHING"
2472 PRINT : PRINT : TYPE YES OR NO"
2475 INPUT AS: IF AS = "NO" THEN GOTO 2482
2478 IF AS = "YES" THEN X(K) = Q: GOTO 2326
2480 GOTO 2470
2482 GOSUB 700
2485 SS(K) = SS(K) + E(K) * 100
2490 SC(K) = SC(K) + C(K): SH(K) = SH(K) + CH(K)
2495 SL(K) = SL(K) + L(K)
2500 PRINT "WHAT IS YOUR SELLING PRICE FOR AN": PRINT
2505 PRINT "ICE-CREAM CONE IN PENCE": PRINT
2510 INPUT A(K)
2540 PRINT "WHAT IS YOUR SELLING PRICE FOR A": PRINT
2545 PRINT "CHOC-ICE IN PENCE": PRINT
2550 INPUT D(K)
2560 PRINT "WHAT IS YOUR SELLING PRICE FOR A": PRINT
2565 PRINT "LOLLY IN PENCE": PRINT
2570 INPUT E(K)
2572 PRINT : PRINT : PRINT "DO YOU WISH TO CHANGE ANYTHING"
2573 PRINT : TYPE YES OR NO"
2575 INPUT AS: IF AS = "YES" THEN GOTO 2500
2578 IF AS = "NO" THEN GOTO 2580
2578 GOTO 2574
2580 GOSUB 200
2590 GOSUB 400
2600 GOSUB 500
2700 GA(K) = PA(K) * MKT: IF GA(K) > SS(K) THEN GA(K) = SS(K)
2705 IF GA(K) > SC(K) AND SS(K) > SC(K) THEN GA(K) = SC(K)
2710 GE(K) = PE(K) * MKT: IF GE(K) > SL(K) THEN GE(K) = SL(K)
2715 GD(K) = PD(K) * MKT: IF GD(K) > SH(K) THEN GD(K) = SH(K)
2720 AS(K) = SS(K) - GA(K): RC(K) = SC(K) - GA(K)
2730 RH(K) = SH(K) - GD(K)
2740 RL(K) = SL(K) - GE(K)
2750 X(K) = X(K) + (GA(K) * A(K) + GD(K) * D(K) + GE(K) * E(K)) / 100
2760 GOSUB 600
2800 GOSUB 400
2950 NEXT K
3000 FOR K = 1 TO V
3005 GOSUB 1700
3010 GOSUB 700
3015 PRINT "VAN": K: " " : AS: PRINT
3020 PRINT "TRADING POSITION AT THE END OF THE DAY": PRINT
3030 PRINT TAB(10); "STOCK": TAB(20); "STOCK": TAB(30); "STOCK": PRINT
3040 PRINT TAB(10); "A.M.": TAB(20); "SOLO": TAB(30); "LEFT": PRINT
3050 PRINT "ICE"
3060 PRINT "CREAM": TAB(10); SS(K): TAB(20); GA(K): TAB(30); AS(K)
3070 PRINT "PORTIONS": PRINT
3080 PRINT "CONES": TAB(10); SC(K): TAB(20); GA(K): TAB(30); RC(K): PRINT
3090 PRINT "CMOC-ICES": TAB(10); SH(K): TAB(20); GD(K): TAB(30); RH(K): PRINT
3100 PRINT "LOLLIES": TAB(10); SL(K): TAB(20); GE(K): TAB(30); RL(K): PRINT
3200 PRINT "CASH IN HAND * X(K):" POUNDS"
3210 PRINT : PRINT : GOSUB 100
3220 SS(K) = SS(K)
3230 SC(K) = SC(K)
3240 SH(K) = SH(K)
3250 SL(K) = SL(K)
3260 NEXT K
3270 NEXT D
5000 GOSUB 700
5010 PRINT TAB(15); "SUMMARY": PRINT : PRINT
5020 PRINT TAB(10); "VAN": TAB(15); "CASH IN HAND": TAB(31); "PROFIT":
PRINT
5030 FOR K = 1 TO V
5035 PRINT TAB(11); K: TAB(22); X(K): TAB(32); K(K) - 100
5040 NEXT K
5050 GOSUB 9500
6000 END

```





RUNS ON A VIC-20 IN 3-5K

Well guv, there we were sitting in the old jam jar when everything went reels of cotton. The biag was going well and the boys was just about to leg it when the Old Bill turns up. Not yer ordinary rozzers though. These geezers fort they was angels. Swooping out of the sky in a bloomin' helicopter! It was enough to give you a real turn. The boys was throwing the swag in the back of the motor and I gave it some wellie and steamed off and that's when I ran into you guv. . . ."

This is a game of skill and chance. You are a bank robber and your gang is throwing their ill gotten gains down at the getaway car. You have

THE CRO BLAG

```

1 POKES6879,188.C=36878:L=36877:PRINT"J" H=0 R=36875:US$="XXXXXXXXXXXX" F=38720
2 DEFFNA(U)=INT(U/RND(0))
3 M=250 POKEC,10 POKER,175:GOSUB12
4 POKER,167:GOSUB12
5 POKER,159:GOSUB12
6 POKER,151:GOSUB12
7 POKER,147:GOSUB12
8 POKER,191:GOSUB12
9 POKER,0:M=50:GOSUB12
10 POKER,191:M=250:GOSUB12
11 POKEC,0:POKER,0:GOTO13
12 FORE=1TOM NEXT RETURN
13 S=0 J=3:X=0
14 REM SET UP SCREEN
15 FORA=7680T07723 POKER,156:POKER+F,5:NEXTRA:FORB=8142T08185:POKER,156:POKER+F,
5 NEXTB
16 FORG=1T0100:PRINT"XXXXX
17 PRINT"XXXXXXXXX CATCH THE GOODS"
18 PRINT"XXXX BY HOWARD EVANS 1982." NEXTG
19 PRINT"XXXXXXXXX PRESS XXXX FOR"
20 PRINT"XXXXXXXXX INSTRUCTIONS OR"
21 PRINT"XXXXXXXXX ANY OTHER KEY TO"
22 PRINT"XXXXX CONTINUE"
23 REM INPUT ANSWER
24 POKEX198,0
25 GETA$:IFA$=" "THEN25
26 IFA$="Q" THENPRINT"J":GOTO42
27 REM INSTRUCTIONS:PRINT"XXXXX YOU ARE A BANK ROBBER"
28 PRINT"AND YOUR ACCOMPLICES"
29 PRINT"ARE THROWING THE GOODS"
30 PRINT"DOWN TO YOU."
31 PRINT"XXXXX YOU HAVE TO MOVE THE"
32 PRINT"XAVAN AT THE BASE OF THE"
33 PRINT"SCREEN, TO CATCH THE"
34 PRINT"XGOODS, BY PRESSING "-"
35 PRINT"XXXXX TO MOVE RIGHT &"
36 PRINT"XXXXX TO MOVE LEFT"

```



```

37 PRINT"PRESS ANY KEY TO"SPC(6)"CONTINUE"
38 GETH$ IFH$=""THEH38
39 PRINT"J"
40 REM BEGIN GAME;SET VARIABLES AND SET UP SCREEN
42 RS=FNA(5):FORA=8164TO8165:POKEA,168:POKEA+F,0:NEXT IFRS=4THENS=22
43 PRINT"J"
44 PRINT"GOODS=\":S
45 PRINT"SPC(14)"LIVES=\":J
46 PRINT"HI-GOODS=\":H
47 PRINT"HI-GOODS=\":H
48 PRINT"HI-GOODS=\":H
49 PRINT"HI-GOODS=\":H
50 P=FNA(19):O=FNA((10)+1)*10 IFRS<4THENS=44
51 T=P+7813
52 FORD=TTOT+338STEP50
53 POKEC,9:POKE,200:POKE,0
54 POKE,156:POKE+F,4:POKE-22,32:POKE-44,32
55 REM MOVE VAN?
58 IFPEEK(197)=36ANDXC16THEHX=X+1
59 IFPEEK(197)=33ANDX=0THENX=X-1
60 PRINT"US"
61 PRINTTAB(X)"PRINTTAB(X)"
61 PRINTTAB(X)"PRINTTAB(X)"

```

BYDON

```

62 IFPEEK(D+22)>32ANDPEEK(D+22)>160THEN70
63 REM MOVE BAG
65 POKEC,0:NEXTD
66 REM MISSED BAG!
67 POKEC,10:POKE,32:POKE-44,32:POKE-22,32:S=S-20:POKE,128:M=100 GOSUB12
68 POKE,0:GOTO73
69 REM CAUGHT BAG!
70 S=S+0:POKE,32:POKE-44,32:POKE-22,32:POKE36876,200
71 M=100 GOSUB12:POKE36876,0
72 REM GOTO HELICOPTER SEQUENCE?
73 POKEC,0:Y=FNA(7):IFY=1THEN88
74 GOTO42
75 REM END SEQUENCE
76 PRINT"GOODS=\":S
77 IFNCSTHEH=S
78 PRINT"HI-GOODS=\":H
79 PRINT"HI-GOODS=\":H
80 REM ANSWER TO QUESTION
81 POKE198,0 INPUT$
83 IFV$="Y"THEPRINT"J" GOTO3
84 IFV$="N"THEN76
86 PRINT"US"
87 REM HELICOPTER SEQUENCE
88 PRINT"J"

```

to move the van to catch the swag.

Meanwhile a police helicopter is homing in on the scene of the robbery. You can delay it by guessing the correct code letter — if you are wrong it's at least 20 years in the slammer for you and your mates!

You get three lives before those jailhouse doors slam shut on you. The money bags are worth between 10 and 100 points — but if you miss one you lose 20 points. The program includes REM statements for explanation only and should NOT be typed into your computer — otherwise the listing will exceed 3.5K.

But be sure to turn to page 43 before you start keying in this program. You'll find an important message which will help avoid any problems. And when you get around to playing this game you'll find you will have enough problems to deal with.

Top score at present is 4760. Can you beat it?

BY HOWARD EVANS



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The Jupiter Ace uses FORTH

The Jupiter Ace personal computer runs in FORTH, an easily understood language, typically four times as compact and ten times as fast as BASIC. Before the Ace all personal computers used BASIC and FORTH was only available to a privileged few. The Jupiter Ace also features a full-size moving-key keyboard, high-resolution graphics, sound, floating point arithmetic, a fast and reliable cassette interface and 3K of RAM.

Available soon

Plug-on parallel printer interface.

For around £20.00 this will connect your Jupiter Ace to anything from high-speed dot matrix to letter-quality daisy wheel printers.

Plug-on 16K Memory Expansion

For around £30.00 you will increase the memory of your Jupiter Ace to 19K giving you instant access to enormous amounts of information.

Software

A catalogue will be sent with every machine, and includes, initially, programs for education and entertainment.

Technical Information

Hardware

Z80A running at 3.25 Mhz.
8K bytes ROM
3K bytes RAM

Keyboard 40 Moving-key keyboard with auto repeat on every key and Caps Lock.

Screen Memory mapped 32 column x 24 line flicker-free display with upper and lower case alpha-numeric set.

Graphics Chunky graphics (64 x 40 pixels) may be plotted, unplot or over-plotted (XOR operation). Also the entire character set (128 characters and their video inverses) may be redefined allowing intricate shapes to be drawn with a resolution equivalent to 256 x 192 dots.

Sound Internal loudspeaker may be programmed to operate over the entire audio spectrum.

Cassette Programs and data in the compact dictionary format may be saved, verified, loaded and merged. Blocks of memory can be saved, verified, loaded and relocated. All tape files are named. Rewinding at 1500 baud, the Ace will connect to most portable tape recorders.

Expansion Port Controls D.C. power rails and full Z80 Address, data and control signals. May be used to connect extra memory and other peripherals. IN and OUT words allow port-based peripherals to be addressed.

Data Structures Integer, Floating point and String data may be held as constants, variables or arrays with multiple dimensions and mixed data types. There are no restrictions on names.

Control Structures IF-ELSE-THEN, DO-LOOP DO-4-LOOP, BEGIN-WHILE-REPEAT, BEGIN-UNTIL, all may be mixed and nested to any depth.

The Jupiter Ace closely follows the FORTH 79 standard with extensions for floating point, sound and cassette. It has a unique and remarkable editor that allows you to list and edit words that have been previously compiled into the dictionary. This avoids the need to store screens of source, allowing the dictionary itself to be saved on cassette. Comprehensive error checking removes the worry of accidentally crashing your programs.

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Steven Vickers and Richard Altwasser played a major role in creating the ZX Spectrum and then formed Jupiter Cantab to develop advanced ideas in personal computing. The Ace is the result, another all-British computer to lead the world.

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```

89 VO=0:NU=0 POKE198,0
91 Q=0000:V=FNA(26)+65:IFX=16TLENX=15
92 N=CHR$(V)
96 FORI=1TO50
97 PRINT"J"
98 PRINT"LOOK OUT!"NEXTI
99 PRINT"COPS ARE COMING"
100 PRINT"TO LOSE THEM PRESS "
101 PRINT"THE CORRECT LETTER "
102 PRINT"KEY"
103 REM SET UP SCREEN
104 FORA=8164TO8185 POKEA,160:POKEA+F,0:NEXTA
105 VO=VO+NU POKEC,VO:POKE198,0
106 PRINT"U$
107 PRINTTAB(X) "PRINTTAB(X) " "PRINTTAB(X)" " " "
108 REM POKE HELICOPTER ON
109 POKEQ,120 POKEQ+F,0 POKEQ-1,120:POKEQ-1+F,0 POKEQ-2,120:POKEQ-2+F,0 POKEQ-2
2,117
110 POKEQ-22+F,6:POKEQ-23,117:POKEQ-23+F,6 POKEQ-44,160:POKEQ-44+F,6 POKEQ-45,1
70
111 POKEQ-45+F,6 POKEQ-46,160 POKEQ-46+F,6 POKEQ-47,160:POKEQ-47+F,6:POKEQ-48,1
60
112 POKEQ-48+F,6:POKEQ-49,95 POKEQ-49+F,6:POKEQ-66,77 POKEQ-66+F,1:POKEQ-113+F,
0
113 POKEQ-67,160 POKEQ-67+F,6 POKEQ-68,233:POKEQ-68+F,6:POKEQ-71,219 POKEQ-71+F
0
114 POKEQ-89,93:POKEQ-89+F,0:POKEQ-109,100 POKEQ-109+F,0 POKEQ-110,100 POKEQ-11
0+F,0
115 POKEQ-111,100 POKEQ-111+F,0:POKEQ-112,100 POKEQ-112+F,0:POKEQ-113,100
116 PRINT"U$PRESS A KEY"
117 REM INPUT GUESS
118 POKEL,210:M=10 GOSUB12 POKEL,0
119 POKEL,150
121 GETM:IFM$=""THENPOKER,0:GOTO118
122 IFM$=N:TEN=127
123 REM IS GUESS CORRECT?
124 IFPEEK(Q+1)<32THEN136
125 REM GUESS WRONG , MOVE HELICOPTER
126 PRINT"Q=Q+1 NU=1 GOTO184
127 PRINT"U$YOU WERE LUCKY!"
128 PRINT"YOU GUESSED IT"
129 REM PLAY TUNE FOR CORRECT GUESS
130 POKEC,10
131 FORSY=128TO250STEP3
132 POKER,SY:M=30 GOSUB12:NEXTSY
133 REM GO BACK TO GAME
134 PRINT"J" POKEL,0:POKER,0:GOTO42
135 REM GUESSED WRONG!:CAUGHT BY COPS
LOSE A LIFE!
136 POKEL,0:POKER,0
137 PRINT"U$
138 FORZ=1TO50:PRINT"J
"PRINT"YOU'RE NICKED!!!"NEXTZ
139 PRINT"THE LETTER WAS "N$
141 POKEC,10
142 POKER,201:M=250:GOSUB12
143 POKER,191:M=250:GOSUB12
144 POKER,207:M=150:GOSUB12
145 POKER,201:M=250:GOSUB12
146 POKER,191:M=450:GOSUB12
147 POKEC,0:POKER,0:GOTO149
149 J=J-1 S=S-100
150 IFJ=0THENPRINT"J".GOTO76
151 PRINT"J" GOTO42

```



NOTE, A "V" OR A "M" IS A POUND SIGN ON THE VIC20 THIS IS BECAUSE THIS PROGRAM WAS LISTED ON A PET PRINTER



NOTE, A 'V' OR A 'W' IS A
POUND SIGN ON THE VIC20
THIS IS BECAUSE THIS PROGRAM
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But things haven't changed that much, there's still a fuel crisis going on... and the present state of the interstellar recession... well, who knows where you'll stand one millennium to the next?

The Klingons have put up the price of uranium rods again and here you

are stranded on planet with a great stack of the fuel which the known galaxy is crying out for and no easy way to get it on board your ship.

The problem lies in the dreaded anti-matter rods which are mixed in with the uranium, a false move and you could see the whole lot disappear into limbo. If you could just master these paddle controls...

The instructions are included with this simulated computer reconstruction of the dilemma. Good loading.



RUNS ON AN ATARI 400 IN 16K

BY MARTIN STIBY

```
REM NUMBERS      by Martin Stiby
REM WARNING: THIS USES PADDOLES
DIM A$(5):PRINT "Do you really want
instructions?":INPUT A$:IF A$(1,1)="N"
THEN 90
15 PRINT "You are collecting up uranium
rods":PRINT "for your space ship.They a
re to be"
20 PRINT "found in bundles of 1-9, and a
few":PRINT "GREEN in colour."PRINT "Unf
ortunately, there are anti-matter"
25 PRINT "bundles in the same area.These
are":PRINT "BLUE, and will obliterate a
equal"
30 PRINT "number of green rods.":PRINT "
Your time remaining and score are":PRIN
T "shown at the bottom."
35 PRINT "BE WARNED: Occasionally your
green":PRINT "will malfunction. Press t
he button on"
40 PRINT "paddle 0 to repair the problem
":PRINT "PRINT " Paddle 0 is horizon
tal movement"
45 PRINT "Paddle 1 is vertical movemen
t":PRINT "PRINT
50 POKE 764,255:PRINT "          any key, pl
ease"
55 IF PEEK(764)=255 THEN 86
60 POKE 764,255:PRINT "CHANGING CHARACTE
R SET - 10 secs."
65 C=5216:FOR A=57440 TO 57856:B=PEEK(A)
:POKE C,B:C=C+1:NEXT A:FOR A=5120 TO 521
0:B=PEEK A:B=PEEK A:B=PEEK A
100 GRAPHICS 1:SETCOLOR 0,12,6:SETCOLOR
0,0,14:POKE 752,1:TIME=500:PRINT "TIME
SCORE"
200 A=1:B=20:C=9:D=33:E=0.5:F=3216:0.9:H
=56:1=228:K=5:L=0:M=1:P2=11.5:N=138:0=2
0:6=228:SCORE=0:POKE H,D
1000 SOUND 0,5,50,2,10:X=INT(RND(A)*B):Y=1
```

```
NT:RND(A)*B):Z=INT(RND(A)*C):IF RND(A)>E
THEN Z=Z+128
1010 COLOR Z+0:PLOT 1,Y:X=INT(RND(A)*B):
Y=INT(RND(A)*B):COLOR F:PLOT X,Y:IF RND(A)
>6 THEN POKE H,I:SOUND 1,10,8,8
1020 SOUND 0,0,0,0,8:FOR J=A TO K:GOSUB 15
00:SOUND 0,0,0,0,0:NEXT J:IF TIME=0 THEN 2
000
1030 GO TO 1000
1500 P=S-PADDOLE(L):Q=PADDOLE(M):P1=INT(P/
12):Q1=INT(Q/12):LOCATE P1,Q1,R:IF R=F 0
R 8=N THEN 1700
1600 R=R-0+1:IF R>C THEN SOUND 0,10,10,1
5:R=R-128:SCORE=SCORE-R:GO TO 1700
1610 SOUND 0,20,10,15:SCORE=SCORE+R
1700 IF N=138 THEN N=139:GO TO 1710
1705 N=138
1710 COLOR F:PLOT P3,Q3:COLOR N:PLOT P1,
Q1:P3=P1+Q3:01:IF PTR16(L)=0 THEN POKE H
,I:SCORE=SCORE-A:SOUND 1,0,0,0
1720 TIME=TIME-A:PRINT TIME,SCORE," " :R
ETURN
2000 POKE H,0:SOUND 1,0,0,0,0:PRINT "PRINT
"PRINT "WANT ANOTHER BASH?":INPUT A$:I
F A$(1,1)="Y" THEN 100
2010 GRAPHICS 0:POKE H,224:POKE 752,0:EN
D
4000 DATA 0,0,0,0,0,0,0,0
4001 DATA 0,2,4,0,16,32,64,0
4002 DATA 0,126,0,64,32,16,8,0
4003 DATA 0,126,0,30,112,0,126,0
4004 DATA 0,36,72,18,36,72,18,4
4005 DATA 84,84,84,0,254,0,254,0
4006 DATA 0,82,82,0,42,42,42,0
4007 DATA 220,0,112,0,108,0,238,0
4008 DATA 0,170,170,0,162, 170,138,0
4009 DATA 0,219,0,108,0,170,170,0
4010 DATA 0,24,60,66,66,66,66,0
4011 DATA 0,24,60,66,66,36,24,0
```

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S COMES BUT S AS GREAT AS THESE A LIFETIME.



You'll need to move very fast to destroy this enemy, for the more you shoot down, the faster they get. So even though your chopper is really manoeuvrable (a touch on the joystick sends it into an instantaneous 180° turn) you'll find the opposing helicopters and jets very difficult to defeat. It's by no means easy. It requires lots of strategy and lightning reflexes and that's why 'Chopper Command' is destined to become one of the all-time video game classics.

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'Bringing leisure to life'

RUNS ON AN ATOM IN 12K

MONSTER

1REM MARKUS JAKOBSSON

2REM ALSTORP 5 57

3REM S-24021 LÖDDEKÖPINGE

4REM SWEDEN

5REM

200:HL9,M768,L2:P,021:H=0

30P:#3010;U=#0002;T=#3000

35:T=0;T71=0;T72=0;T73=0

40C

50 LL0 LDX00;LDY00

60:LL1 LDX #02 / 07A #08;X)

T0:NY;LD#00;CLC;ADC#20;STA#00

80LDA#01;ADC#0;STA#01

90:LL2 CPY00;BNELL1

BY MARCUS JAKOBSSON



MONSTER

It is the year 2017. You are the sole survivor of a scientific research mission which came to grief on the recently discovered planet Xirc. Your ship crashed on one of Xirc's many small moons en route to the Andromeda research colony.

You were left habited to guard the ship when your nine fellow astronauts decided to go down to the surface of the planet. They did not return. You discovered that the moon was inhabited by creatures called Geofos who at first seemed friendly — but later caught you and transformed you into a monster.

Your only hope is the antidote. This will reverse the transformation and give you a chance to complete repairs to your ship and escape the infested moon.

The only problem is that the antidote is contained in the Geofos themselves. You have to eat as many as you can before you will return to human shape. Concerning the Geofos is difficult — and there are four types of these unsavoury creatures. The Megafos are four legged spider-like being, the Xymers, a rare breed of Geofos and the best tasting, the Tyrolites, very poisonous and eventually deadly if you eat too many and the Imposures who are invisible but have the ability to transform into any of the above types of Geofos.

The best Geofos to eat are the Xymers, but they are hard to find, the Megafos are plentiful but will not spend

your transformation a great deal. If you devour more than three Tyrolites — it's goodbye cruel universe. Imposures are tricky creatures one minute they can look like harmless Megafos, then they'll suddenly become a poisonous Tyrolite.

Megafos score one point toward your transformation, Xymers are worth 10. When you reach a multiple of 100 you'll feel better and get a bonus. Instead of using a knife and fork to eat the Geofos the controls are T for up and F for down.

And remember — don't forget the indigestion tablets!

100:RTS

110:LL3 JSR#FE71,STY#21C,RTS

120:LL4 LDX00

130:LL5 LDA L1;STA U

140:AND#40;ADC#40;ASLA;ASLA;ROLL+2;ROLL+1;ROLL;INX;BNE LL7

150:RTS

160:P.#05

170F,A=#0707,A71=0,N

180:#2000=#F9FC763C;#2004=#003C7EFC

200:#2000=#FFFF763C;#200C=#003C7EFC

220F,A=#0707,A72#010=0,N

230:#2010=#10200000;#201C=#00000020

250:#2020=#30100000;#2024=#00001010

270:#2020=#7E7E1010;#202C=#10101010

280:#2030=#7E3C1000;#2034=#0010307E

290:#2030=#DC100000;#203C=#00000010

295GOS,Z

300F,A=#0707,A7#2040=0,H

310F#2043=#10;#2044=#10

320F#03=#20;Z=0;F#99;S=0

330GOS,Q;CLEAR4

335GOS,h

337GOS,L1;GOS,b1;#02=7

336GOS,k

340L1,LL0

350GOS,d;IFW=1;W=0;#00=0;CLEAR4,F#99;G,335

360F#02=0;#01=7#01-1

370L1,LL0

380GOS,c

390F#02=#10

400F#01=7#01-1

410L1,LL0;#01=7#01-1;#00=7#00+1;#02=0;IF#00

30;GOS,b

420GOS,a

430G,340

440b7#00=1;#01=A,R;#0+09;R,

450E,

460A

470L1,LL3

480IF#21C=1;#01=7#01-1;IF#01<#04;#01=#04

490IF#21C=31;#01=7#01+1;IF#01>#37;#01=#37

500F#21C=0

510R,

520C=7#00;P=7#01

530G=1;#02=#10

540F,A=1T02

550C=A,R;#25;D=A,R;#20

568E=C+(D*32);E7H=G;C=0+6
 578D=0+84;7#80=C;7#81=0
 588L.I.LL8
 598IFR.A.%15-KX>3;7#82=#20;G=2
 591N.
 599IFR.A.%10=3;GOS.J
 6087#82=0;7#81=P
 618R.
 628dIFSC99 A. K>2.WAIT,IFX>7;F.A=1T05;WAIT;N.
 638D=7#80.A=7#81;A=R-#85;D=2-6
 648R=D+(A*32);IFH7=1;A7M=0;S=S+1;GOS.#
 6581FR7M=2;A7M=0;Z=Z+1;GOS.F
 6551FR7M=3;S=S+10;GOS.1
 668R.
 678e
 688F.A=0T02;A7L=A.R.%1000.N.;LI.LL4;IFF(S.F=F+100;GOS.#;G.700
 698GOS.h
 708R.
 718f



728F.A=1T010;LI.LL4;N.
 7387#81=7#81-1
 7487#82=#30;LI.LL8
 7587#81=7#81-1;F.A=1T060;WAIT;N.;7#82=#30;LI.LL8
 7#81=7#81-1
 768F.A=1T060;WAIT;N.;7#82=#40;LI.LL8;F.A=1T040;
 WAIT;N.
 7787#81=7#81-1;7#82=#10;LI.LL8
 7887#81=#81;7#82=#1E-2
 7987#82=#20
 808L.I.LL8.GOS.b
 8181FZ>2;F.A=1T0760;A7M=8;N.;GOS.k;N=1;G.838
 828F.A=1T060;WAIT;N.
 838R.
 848g
 858!#2948=#44444438;1#284C=#38444444
 868F.A=0T07;A7#2850=0;N.;7#2851=#18
 878!#2850=#80482423C;1#285C=#7E482818
 888!#2860=#8C82423C;1#286C=#3C428282
 898!#2860=#48282818;1#286C=#88887C48
 908!#2870=#7C48407E;1#2874=#30448282
 918!#2878=#30482818;1#287C=#304482C4
 928!#2880=#80484827E;1#2884=#18188838
 938!#2888=#3C42423C;1#288C=#3C424242

1280!#2890=#44444438;1#2894=#3888843C
 1811!#2090=#38388880;1#289C=#88888838
 1828R.
 1838V=S;I=0;D=7#80;P=7#81;7#80=5
 1848D T7I=V%10;V=V/10;I=I+1;U,V=8
 18587#81=#81
 1868F.A=0T03;7#82=<T7R>#8+48
 185LI.LL8.7#81=7#81-1;7#80=7#80-1;N.
 18787#80=0;7#81=P;R.
 1888J
 1898C=A.%25;D=A.R.%28
 1188E=C+(D*32);E7M=3;C=C+0+84;7#80=C;7#81=D;7#82=#98
 1118L.I.LL8;A.
 1128F.A=0T03;A7L=A.R.%10;LI.LL4;N.;GOS.h;IFS>F;F=F+100;GOS.#
 1121A.
 1125KIFS>H.H=0
 1126GOS.1
 11385=0;F.A=0T03;A7T=0;N.
 11481FZ>0;Z=0;F.A=1T038;LI.LL4;N.;LI.#FFE3
 1158R.
 116817#80=#A;V=N;I=0;GOS.1048
 1178R.
 1188F.A=1T020;LI.LL4;WAIT;N.
 11857#81=7#81-1;7#82=#10;LI.LL8
 11987#80=#18;F.A=1T03;7#81=#81;LI.LL8;7#80=7#80+1
 1195N.;7#80=1;7#81=A.R.%8+88
 12082=0;A.
 1218P.#12"
 1228P." MONSTER""DIFFICULTY 1 HARD"
 2 MEDIUM"



1238P. 3 EASY
 1248P. 4 LEARN""
 1258IN."WHICH LEVEL DO YOU WANT"
 1268IFX>4OR K<1;P.#1;LI.#FE22;G.1258
 1265K=<K2
 1278R.

FROGGER



RUNS ON A SPECTRUM IN 16K

BY STEPHEN ANTILL

Ribbit! Ribbit! Hi there, I'm Hopalong Green, your guide on this tour through the swamps and pools of Frogville. I'm here to show you how my little green buddies survive in this fast moving world of ours.

As you may know many of us frogs have to commute between our homes in the soggy swamplands and the feeding grounds. Unfortunately there's a fast flowing river and a two lane highway in between. This makes commuting considerably more difficult than just catching the 8.10 to Paddington. With a hop, skip and a jump the merry band of webbed wonders brave the dangers of road and river.

They have to go it alone when crossing the road, but there are friendly turtles in the river who will lend a hand — or more correctly a shell — to see the frogs safely on their way.

They also hitch a lift on useful barrels which float down river from the local brewery. Many a frog has arrived home late with a lopsided hop and a silly grin on its face after staying too long on a barrel.

Now you too can experience the daily frog-rush. Simply plug in your Spectrum and program in this listing.

Just like the real thing the rush is split into two halves. First you must cross the road — which has four lanes of fast moving traffic, then comes the river and the turtles. The frogs simply have to get to the safety of the riverbank. To start with it's fairly easy — but it gets harder as the rush progresses.

By the way, there are 17 difficulty levels, and the frogs are moved by using the Z key for left, X for right, M for up and N for down.

You get three lives for each rush hour and there are 17 difficulty levels.

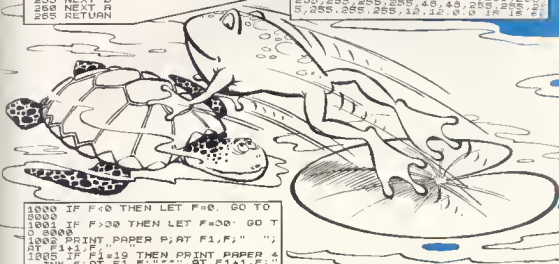
OK, frog lovers, now it's all up to you. Hop to it! The main variables are:

TS	Top score
S	Your score
FL	Number of frogs left
R	Round number
AS(4,64)	Stores car or turtle/barrel positions
XS, YS(4,128)	To print the lanes of cars/turtles/barrels
A,B,C,W	General use
F,F1	Frog screen coordinates
G,G1,G2	Used to check move
P	Paper colour
T	Time left

```

1 BORDER 0. PAPER 0. RANDOMIZ
2 CLS: PGM 1982, S. ANTILL
3 LET TS=0: GO SUB 7000
4 PRINT INK 3, AT 3,0, "
5 "
6 "
7 "
8 "
9 "
10 LET P=1
11 GO TO 3000
12 DIM AS(4,64): DIM XS(4,128)
13 DIM YS(4,128)
14 FOR A=1 TO 4
15 FOR B=1 TO 3+A
16 LET C=INT (RND*45)+1
17 LET AS(A,B)="1"
18 IF C<17 THEN LET AS(A,48+C)
19
20 NEXT B
21 FOR A=1 TO 64
22 IF AS(A,B)=" " THEN GO TO 7
23
24 IF A/2=INT (A/2) THEN GO TO
25
26 LET XS(A,B+2-1 TO B+2)=" "
27 LET YS(A,B+2-1 TO B+2)=" "
28
29 LET XS(A,B+2-1 TO B+2)=" "
30 LET YS(A,B+2-1 TO B+2)=" "
31 NEXT A
32 NEXT B
33 RETURN
34 CLS: FOR A=1 TO 96: PRINT
35 INK 6, PAPER 4, "NEXT A
36 FOR A=1 TO 16: PRINT PAPER
37 P, "
38 NEXT A
39 FOR A=1 TO 96: PRINT PAPER
40 INK 8, "NEXT A
41 PRINT INK 7, AT 0,0, "FROGGER
42 P, "TOP="TS, AT 21,0, "SCOPE=
43 S, "TIME=
44 LET F1=19. LET F=16: LET T=
45 185-P*3
46 FOR B=1 TO 96
47 PRINT INK 7, AT 21,21;T, "
48 FOR A=1 TO 3 STEP 2
49 IF P=1 AND F1=A*4 THEN LET
50 F=F1
51 PRINT INK A+1; PAPER P; AT A
52 +4,0; XS(A,B TO B+31); AT A+4+1,0;
53 YS(A,B TO B+31)
54 NEXT A
55 GO SUB 1000
56 FOR A=2 TO 4 STEP 2
57 IF P=1 AND F1=A*4 THEN LET
58 F=F1
59 PRINT INK A+1; PAPER P; AT A
60 +4,0; XS(A,97-B TO 128-B); AT A+4+

```

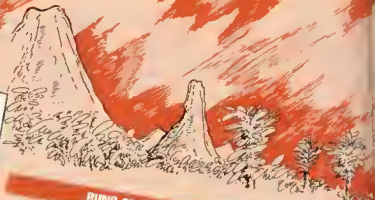
[illegible]

```

0000 7. READ C. POK
0001 NEXT B. NEXT A
0002 RETURN
0003 PRINT INK 7. PAPER 0. FLAS
0004 AT 1.1. F. AT 1.1. F. FLAS
0005 W=0 TO 10 STEP 1.2. S.
0006 BEEP 0.2. W BE
0007 NEXT W
0008 BEEP 1.2. +15
0009 LET FL=FL-1
0010 IF FL=0 THEN GO TO 100
0011 GO TO
0012 PRINT 0. LASH 1, INK 7, PAPER
0013 1.10 "GAME OVER"
0014 FOR A=5 TO 50 STEP 0.5
0015 BEEP A. NEXT A
0016 IF 5.15 THEN LET S=5
0017 FOR U=1 TO 50 NEXT U
0018 C=1
0019 GO TO 100

```

10 REM --- SUPER LANDER! ---
 20 REM
 30 REM
 40 REM [Written by P.Nicholls,
 50 REM
 60 REM
 70 REM *** COPY ME!!
 80 REM I WANT TO TRAVEL!! ***
 90 REM



RUNS ON A BBC MODEL B

OR EXPANDED MODEL A

BY PHILLIP NICHOLLS

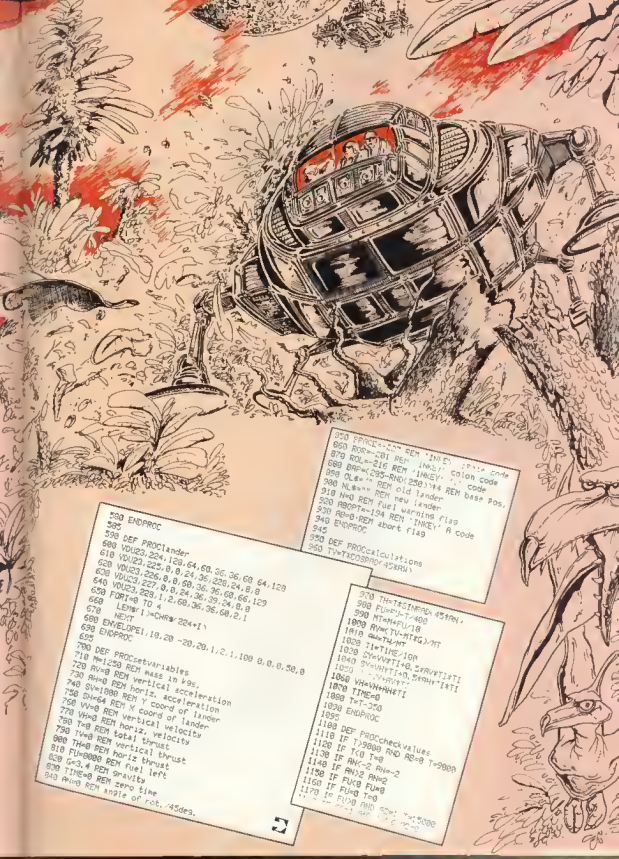
```

100 DIMLEN(4),ME(4),ML(4)
110 PROCessa9e
120 PROClander
130 MODE1
140 I$FE00$=102000
150 PROCInstructions
160 PROCsetvariables
170 PROCsetscreen
180 TIME=0
190 PROCupdate
200 PROCkeycheck
210 PROCcalculations
220 PROCcheckvalues
230 PROCchoices
240 PROCmemstring
250 PROCfuel
260 PROCcheckland IF OK=1 GOTO360
270 PROCtote
280 IFOK=1 GOTO300
290 GOTO190
300 SOUND1,0,0,0
310 FORI=1 TO 100 MOVESH.SV GCOLORND(5)-1,RND(4)-1
320 ORASH+RND(300)-150,SV+RND(300)-150
330 SOUND0,-12+(I/15),RND(3)+3,1
340 VDU13,RND(4)-1,RND(8)-1,0,0,0 NEXT
350 ME=ME+RND(100) MOD 5 GOTO450
360 IF VV<10 OR AN<0 GOTO300
370 RESTORE FORI=1 TO 22
380 READM1,M2
390 SOUND1,-0,M1+0,M2*3 SOUND2,-5,M1+25,M2*3
400 SOUND1001,0,0,0
410 NEXT
420 DATA 20,1,20,2,40,1,60,1,40,1,60,1,40,1,30,1,30,2,50,1,70,4
430 DATA 80,1,60,1,40,1,60,1,60,1,40,1,60,1,60,1,100,2,80,1,100,6
  
```

SUPER LANDER

```

440 ME=ME+RND(100) MOD 10
450 NOW=TIME:REPEAT UNTILTIME=NOW+200
460 VDU20,13,1,4,0,0,0:COLOUR129 CLS
470 $FX15,0
480 PRINTTAB(6,10),"THAT WAS ",ME,"!"
490 PRINT""
500 AN=GET$ IFAN<"Y":CLS:I$FE00$=106700 END
510 GOTO160
520 END
525
530 DEF PROCkeycheck
540 IF INKEY(SPACE) T=T+500
550 IF INKEY(ROL) AN=AN-1
560 IF INKEY(ROR) AN=AN+1
570 IF INKEY(ABORT) AN=0 AB=1
  
```



```
850 SPACE=000 REM 'INKEY' 1999 code
860 ROR=C01 REM 'INKEY' 1999 code
870 ROL=216 REM 'INKEY' 1999 code
880 BAP=(255-RND(255))*4 REM base pos.
890 OL=0 REM old lander
900 NL=0 REM new lander
910 NW0 REM fuel warning flag
920 ABOPT=194 REM 'INKEY' A code
930 RE=0 REM abort flag
940 ENDPROC
945
950 DEF PROCcalculations
960 TV=TACOSPROC(453RM)
```

```
590 ENDPROC
595
598 DEF PROClander
600 VDU23,224,128,64,60,36,36,68,64,128
610 VDU23,225,0,0,24,36,220,24,0,0
620 VDU23,226,0,0,68,36,36,68,66,128
630 VDU23,227,0,0,24,36,39,24,0,0
640 VDU23,228,1,2,68,36,36,68,2,1
650 FORI=0 TO 4
660 LEM(I)=CHR(224+I)
670 NEXT
680 ENVELOPEI,19,20,-20,20,1,2,1,100,0,0,0,50,0
690 ENDPROC
695
```

```
700 DEF PROCsetvariables
710 M=1250 REM mass in kg,
720 RV=0 REM vertical acceleration
730 RV=0 REM horiz. acceleration
740 SV=1800 REM Y coord of lander
750 SV=64 REM X coord of lander
760 VV=0 REM vertical velocity
770 VV=0 REM horiz. velocity
780 TV=0 REM total thrust
790 TV=0 REM vertical thrust
800 TV=0 REM horiz thrust
810 FV=0 REM fuel left
820 G=3.4 REM gravity
830 TIME=0 REM zero time
840 AN=0 REM angle of rot./45des.
```

```
900 TH=TASINRAD(453RM)
980 FV=FV-T/400
990 TV=TV-FV/10
1000 RV=TV-TRG/NT
1010 AN=TV-NT
1020 TV=TV-100
1030 SV=SV+TV*0.5,SV+TV*0.5
1040 SV=SV+TV*0.5,SV+TV*0.5
1050 TV=TV-TRG/NT
1060 TV=TV-TRG/NT
1070 TV=TV-TRG/NT
1080 TV=TV-TRG/NT
1090 TV=TV-TRG/NT
1100 ENDPROC
1105
1110 DEF PROCcheckvalues
1110 IF T>9000 AND RV=0 T=9000
1120 IF TV=0
1130 IF AN=2 AN=2
1140 IF RV=2 AN=2
1150 IF FV=0 FV=0
1160 IF TIME=0
1170 IF AN=0 AND G=0 T=5000
```

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EACH

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1190 ENDPROC

1195

1200 DEF PROCnoises

1210 IF FV0 SOUND10, -1100-1.6,7

1220 ENDPROC

1225

1230 DEF PROCchitote

1240 CH=0 FOR C=0 TO 28 STEP 4

1250 H=POINT(SH+C,SV+SC) I=H/2 OP H=I: [L=I

1260

1270 ENDPROC

1275

1280 DEF PROCcheckland

1290 OK=0

1300

1310 ENDPROC

1315

1320 DEF PROCletscreen

1330 COLOUR128 CLS VDU20,19,0,4,0,0,0

1340 GCOL0,1:FORI=1 TO 130 PLOT69,RND(128),RND(734)+290 NEXT

1350 H=350

1360 FOR I=0 TO 1290 STEP 4

1370 P=RND(48)-24 GCOL0,3

1380 IF P+H/292 OR P+H/500 P=P

1390 H=H+P/MOVE 1,256 DRAW I,H-24 GCOL0,2 DRAWI,H

1400 IF I=0-12 IF I<H/32:DRAWI,260

1410 NEXT GCOL0,0

1420 MOVE BAP,260:MOVE BAP,610 PLOT 85 BAP+40,260 PLOT85,DAP+40,610

1430 GCOL0,1

1440 MOVE BAP,260 MOVE BAP,292 PLOT 85:BAP+40,260 PLOT85 BAP+40,292

1450 PRINTTAB(1,25),"/",VEL,

1460 REM *** 16 SPACES IN ABOVE LINE *** H,VEL,""

1470 REM *** 17 SPACES IN ABOVE LINE *** THRUST,"

1480 GCOL0,3 ENDPROC

1490

1500 DEF PROCupdate

1510 PRINTTAB(2,25),INT(VV*10)/10," " TAB(24,25) INT(VH*10)/10," "

1520 VDU-IT:(FUK(1500),-129:FUK(1500)

1530 PRINTTAB(2,30),INT(FU),CHR\$(17),CHR\$(120)," " TAB(24,30),INT(T," "

1540

1550 ENDPROC

1560

1570 DEF PROCJemstrans

1580 CLS+NL

1590 NL=LEMS-2-AH)

1600 VDU5 MOVESH,SV PRINTL5

1610 MOVESH+SV,SV+SV PRINTL5

1620 VDU4 SH=SH+SV/54SV+SV/54 IFED0=1:Q200R

1630 ENDPROC

1640

1650 DEF PROCfuel

1660 IF FV0:500 OR H=1 ENDPROC

1670 SOUND1,1,130,10 N=1 ENDPROC

1680

1690 DEF PROCrestore

1700 RESTORE 1690

1710

1720

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4000

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4070

4080

4090

4100

4110

4120

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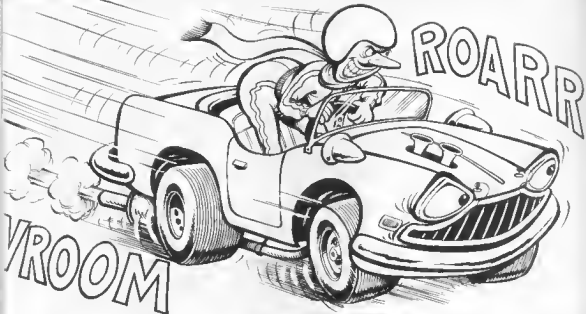
4280

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RUNS ON A SHARP MZ-80K IN 4K

Kerrunch! Skerrape! Ouch! Driving your Sharpmobile can be a tough business. Your only aim is to keep bumping the computer controlled car — before it bumps you!

You score a point for each contact with the computer's car. But you must avoid the unwary pedestrians who cross your path. If you hit one the computer gets a point. It also scores if the computer car hits your much dented vehicle.

You can select the speed of the cars and the number of pedestrians at the start of each game. The score and time are displayed throughout the game.

Be warned, the computer's car is difficult to catch!

BY FRANK ROONEY

Bump

Illustration: Terry Rogers

```

10 REM *** B U M P E R S ***
20 REM *** F.R. ROONEY 1982 ***
30 GOSUB 1170
40 RND=INT(1*32)+1:32:1<=32:1<=32
50 PRINT:8
60 FOR I=32:27:1054:5:78:TEP40:POLE1:R:NEXT
70 FOR I=32:27:1054:5:78:TEP40:POLE1:R:NEXT
80 FOR I=32:27:1054:5:78:TEP40:POLE1:R:NEXT
90 FOR I=32:27:1054:5:78:TEP40:POLE1:R:NEXT
100 FOR I=32:27:1054:5:78:TEP40:POLE1:R:NEXT
110 FOR I=32:27:1054:5:78:TEP40:POLE1:R:NEXT
120 FOR I=32:27:1054:5:78:TEP40:POLE1:R:NEXT
130 FOR I=32:27:1054:5:78:TEP40:POLE1:R:NEXT
140 FOR I=32:27:1054:5:78:TEP40:POLE1:R:NEXT
150 READD1
160 DATA 25,15,21,43
170 POKEAT,B1
180 NEXT I
190 FOR I=32:27:1054:5:78:TEP40:POLE1:R:NEXT
200 FOR I=32:27:1054:5:78:TEP40:POLE1:R:NEXT
210 FOR I=32:27:1054:5:78:TEP40:POLE1:R:NEXT
220 FOR I=32:27:1054:5:78:TEP40:POLE1:R:NEXT
230 FOR I=32:27:1054:5:78:TEP40:POLE1:R:NEXT
240 FOR I=32:27:1054:5:78:TEP40:POLE1:R:NEXT
250 FOR I=32:27:1054:5:78:TEP40:POLE1:R:NEXT
260 FOR I=32:27:1054:5:78:TEP40:POLE1:R:NEXT
270 FOR I=32:27:1054:5:78:TEP40:POLE1:R:NEXT
280 FOR I=32:27:1054:5:78:TEP40:POLE1:R:NEXT
290 FOR I=32:27:1054:5:78:TEP40:POLE1:R:NEXT
300 FOR I=32:27:1054:5:78:TEP40:POLE1:R:NEXT
310 FOR I=32:27:1054:5:78:TEP40:POLE1:R:NEXT
320 FOR I=32:27:1054:5:78:TEP40:POLE1:R:NEXT
330 FOR I=32:27:1054:5:78:TEP40:POLE1:R:NEXT
340 B1=INT(1*32)+1:32:1<=32:1<=32

```

```

350 IF B1=32:17:THEN IF B1=32:17:THEN IF B1=32:17:THEN
360 FOR I=32:27:1054:5:78:TEP40:POLE1:R:NEXT
370 NEXT I
380 NEXT I
390 NEXT I
400 NEXT I
410 NEXT I
420 NEXT I
430 NEXT I
440 NEXT I
450 NEXT I
460 NEXT I
470 NEXT I
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970 NEXT I
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990 NEXT I
1000 NEXT I

```

SQUEEEEL



SCREECH

pers

```

820 REM:K:POKEP,71:FOR EN,0
830 M=V1:GOTO111:P
840 GOTO410
850 Y=Y+1:IF Y=6 THEN GOTO730
860 L=0
870 C1=INT(4*RND(1)+1)
880 IF C1=2 THEN EN=1+40
890 IF C1=3 THEN EN=1
900 IF C1=4 THEN EN=1-30
910 IF C1=5 THEN EN=0
920 Y=Y-1
930 RETURN
940 P$=" MY HIT":GOSUB1530
950 GOTO1130
960 P$=" HARD LUCK, 1 WIN.":GOSUB1530
970 FOR I=1 TO 3:DO NEXT
980 P$=" TO TRY AGAIN, PRESS ANY KEY.":GOSUB1530
990 GETA$1:IF A$="N" THEN 990
1000 IF A$="A" THEN 990
1010 IF A$="D" THEN 990
1020 IF A$="B" THEN 990
1030 GOTO1040
1040 P$=" YOUR HIT":GOSUB1530
1050 C1=1+1:IF C1=4 THEN GOTO1080
1060 GOTO350
1070 P$=" WELL DONE, YOU WIN.":GOSUB1530
1080 FOR I=1 TO 3:DO NEXT
1090 P$=" TO RESTART, PRESS ANY KEY.":GOSUB1530
1100 GOTO980
1110 P$=" YOU HIT A PEDESTRIAN":GOSUB1530
1120 D=D+1:IF D=4 THEN 1190
1130 GOTO350
1140 P$=" TIME UP":GOSUB1530
1150 P$=" ** BUMPERS **"
1160 GOTO1110
1170 PRINT:GOTO1110
1180 PRINT:GOTO1110
1190 M$="B" "A" "D" "B" "F" "E" "D" "B" "C"
1200 M$="B" "A" "D" "B" "F" "E" "D" "B" "C"
1210 TEMP$=M$
1220 PRINT:GOTO1110
1230 PRINT:GOTO1110
1240 IF A$="N" THEN 1250
1250 PRINT:GOTO1110
1260 PRINT:GOTO1110
1270 PRINT:GOTO1110
1280 PRINT:GOTO1110
1290 PRINT:GOTO1110
1300 PRINT:GOTO1110
1310 PRINT:GOTO1110
1320 PRINT:GOTO1110
1330 PRINT:GOTO1110
1340 PRINT:GOTO1110
1350 PRINT:GOTO1110
1360 PRINT:GOTO1110
1370 PRINT:GOTO1110
1380 PRINT:GOTO1110
1390 PRINT:GOTO1110
1400 PRINT:GOTO1110
1410 IF A$="E" THEN GOTO1440
1420 IF A$="F" THEN GOTO1440
1430 GOTO1400
1440 PRINT:GOTO1110
1450 PRINT:GOTO1110
1460 PRINT:GOTO1110
1470 GETA$1:IF A$="N" THEN 1480
1480 IF A$="A" THEN 1480
1490 IF A$="D" THEN 1480
1500 IF A$="B" THEN 1480
1510 RETURN
1520 PRINT:GOTO1110
1530 PRINT:GOTO1110
1540 PRINT:GOTO1110
1550 PRINT:GOTO1110
1560 FOR I=1 TO 1000:DO NEXT
1570 RETURN

```

GOTO 970

GOTO 970

AB114:160T0670

AB114:160T0670

CS=1:160T0670
 =T:V:V:U=V:11:W:1:P=1:160T0410

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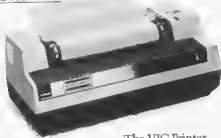
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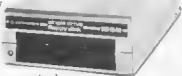
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Each team has a goalkeeper and a back, midfield and forward. The goalkeeper's movements are restricted to the goal-mouth but each of the other men operates in a zone which covers one third of the pitch.

At the beginning of the game the men are positioned randomly in their respective zones. The men in the central zone race to the ball at the centre of the pitch. The first man to the ball has control. A display on line 21 at the bottom of the screen will be in normal print or inverse print depending on who has control of the ball.



```

1 REM 4-A-SIDE NOT NOT NOT NOT (IF
TAN
10 REM 4-A-SIDE FOOTBALL
15 REM (C) B. HORSFIELD 1/82
20 DIM A$(2,15)
25 LET A$(1,1)="DIRECTION 1-12"
40 LET A$(2,1)="STRENGTH 1-12"
50 DIM G$(2,15)
60 LET G$(2,1)="STRENGTH 1-12"
70 LET G$(2,1)="STRENGTH 1-12"
80 LET L$=""
90 LET G1=0
100 LET G2=0
110 GOSUB 900
120 GOSUB 900
130 PRINT 20,4,G1,AT 26,29,CHR$(
102+156)
140 IF G1=10 OR G2=10 THEN STOP

150 LET Z=1
160 IF F/2=INT (F/2) THEN LET Z
=2
170 PRINT AT 21,0,A$(Z)
180 INPUT D
190 IF D>12 THEN LET D=12
200 LET A=D*PI/6
210 PRINT AT 21,0,G$(Z)
220 INPUT S
230 PRINT AT 21,0,L$
240 LET S=INT S+3
250 IF S>15 THEN LET S=15
260 GOSUB 300
270 GOTO 130
280 LET T=1
290 LET U=1
300 FOR F=1 TO 5
310 LET P=0
320 IF 0L<1 OR 0L>16 THEN LET T
=-T
330 IF 0C<1 OR 0C>31 THEN LET U
=-U
340 LET L$=INT 0L
350 LET C$=INT 0C
360 LET 0L=0L-T*0.5 A
370 LET 0C=0C+U*3.14 A
380 IF 0C>31.4 THEN LET 0C=31.4
390 IF S<3 THEN GOTO 420
400 PRINT AT INT 0L,INT 0C
410 LET P=PEEK (PEEK 16398+PEEK
16399*256)
420 IF F=1 THEN GOTO 470

```

```

430 PRINT AT L0,C0," "
440 PRINT AT INT 0L,INT 0C,0
450 IF P=23 OR P=151 THEN GOTO
460
460 IF P=5 OR P=133 THEN GOTO 5
30
470 NEXT F
480 GOTO 510
490 PRINT AT L0,C0," "
500 PRINT AT INT 0L,INT 0C,0
510 GOSUB 600
520 RETURN
530 PRINT AT 21,12,"GOAL",AT 21
12," "
540 IF INKEY$="" THEN GOTO 530
550 IF P=133 THEN LET G2=G2+1
560 IF P=5 THEN LET G1=G1+1
570 CLS
580 GOTO 110
590 LET 0C=INT 0C5 0C
600 LET 0L=INT 0L5 0L
610 FOR F=1 TO 2
620 PRINT AT L(F),C(F)," "
630 IF (0L>7 AND 0L<12) THEN LET
T=L(F)-0L
640 PRINT AT L(F),C(1)," ",AT L
(F),C(2)," "
650 IF L(F)=0L AND C(F)=0C THEN
RETURN
660 NEXT F
670 FOR F=3 TO 8
680 IF (F=3 OR F=4) AND 0C<10 T
HEN GOTO 310
690 IF (F=5 OR F=6) AND 0C<1 OR
0C>20 THEN GOTO 810
700 IF (F=7 OR F=8) AND 0C<21 T
HEN GOTO 810
710 LET L=L(F)
720 LET C=C(F)
730 IF L(F)=0L THEN LET L(F)=L IF
L(F)=0L/ABS (L(F)-0L)
740 IF C(F)=0C THEN LET C(F)=C
(F)=0C/ABS (C(F)-0C)
750 IF L(F)=0L OR L(F)=19 THEN LET
L(F)=L
760 IF C(F)=0C OR C(F)=30 THEN LET
C(F)=C
770 IF F/2=INT (F/2) THEN GOTO
780
780 PRINT AT L,C," "
790 PRINT AT L(F),C(F)," "
800 IF L(F)=0L AND C(F)=0C THEN
RETURN
810 NEXT F
820 GOTO 630
830 DIM L(8)
840 DIM C(8)
850 CLS
860 GOSUB 1200
870 RAND
880 FOR F=1 TO 2
890 LET L(F)=9
900 LET L(F+2)=INT (RND*20)
910 LET L(F+4)=INT (RND*20)
920 LET L(F+6)=INT (RND*20)
930 LET C(F+3)=INT (RND*10+11)
940 LET C(F+4)=INT (RND*10+11)
950 LET C(F+5)=INT (RND*10+21)
960 NEXT F
970 LET C(1)=1
980 LET C(2)=30
990 FOR F=1 TO 5
1000 IF F/2=INT (F/2) THEN GOTO
1010
1010 PRINT AT L(F),C(F)," "
1020 NEXT F
1030 LET 0L=9
1040 LET 0C=15
1050 PRINT AT 0L,0C,0
1060 RETURN
1070 RAND USR 16514
1080 PRINT AT 20,0,L$ L$ L$ L$
1090 FOR F=8 TO 11
1100 PRINT AT F,0," ",AT =,21," "
1110
1120 NEXT F
1130 RETURN
1140
1150 NEXT F
1160 RETURN
1170
1180
1190
1200

```

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VCCVG 11/R2

REVERSI

MIRROR ON MEMORY

I have indicated the basic strategies for playing the game of Reversi, also known as Othello. There are three basic "Rules of Thumb": (1) Aim to capture the corners, while avoiding playing near the corners for fear of giving your opponent a chance. (2) Capture as few pieces as possible early on, as it ironically weakens your position to capture too many. (3) Avoid taking sides unless you are running out of options, as they are a liability at the end.

These three "thumbs" can be carefully balanced to form an effective algorithm for playing Othello. Obvious exceptions can also be added, such as take maximum pieces near the end. But no general "thumb package" can always find the best play, without a detailed list of exceptions — to mirror the way a skilled human selects moves by experience.

The ideal would be a massive memory bank of all possible positions, to tell a computer the best move in each case. You would need to use the whole planet earth as a store for that massive job, and hunchhikers won't always find the answer is 42!

Human beings manage with their limited memory by being very selective in what they learn. We can do the same with a computer, because the symmetry of the board combines nicely with the fact that

BY JOHN BALL

it is surprising how we all assume certain abilities in human beings. For example, I covered many important side positions in my book *Key To Othello* with the assumption that my readers had the ability to spot mirror images elsewhere on the board in real games. Computers do not have this in-built pattern recognition, so have to be taught.

most vital plays are on the side two rows of the board.

If we work out all the positions on one side, that our Thumbs have missed, we can then describe a mirror image for that same side to cover positions that are the same but the other way round. The same patterns can then be repeated for the other three sides. This provides a memory hall of eight mirrors for the computer to reflect on.

To save memory space, a system of labels for just one "set" can be re-used eight times for the mirrors, by suitable computer loops. Then any additional positions you discover need only be written-in once in the mirror section.

How does this mirror system work? Basically, you are putting special attractive values to a square if the position around it fits a certain shape.

For example in figure 1, there is a hole in a side at "A". If as Black, you don't play there, your opponent will, gaining an option as well as a solid side.

Othello is all about fighting for

options — choices of moves — so such spots should be pounced on. Simply tell the computer in the mirror section that if b, c, and d are occupied, then play at A, or at least make A highly attractive.

A more complicated item is shown in figure 2. Your opponent has played a terrible move — near a corner. To exploit this fully you must play first at F, then at G, then at H, all the time watching out for any replies that should evoke a different response.

The end result should be a captured corner, and an easily won game. So put lots of ifs and buts in the memory mirror, to make sure that the computer plays in the correct sequence.

Watch out for cracks in the mirror. In figure 3, playing as Black at I is obviously essential to save the corner at J. So you describe the five pieces in between, and say that I is massively attractive.

But what if white had a piece at J? Then it becomes essential to avoid I, as it would give away the whole side and next corner. So make sure that you specify all the relevant squares.

Once you have a mirror system established, every time you discover a weakness in the computer's play you simply add another line to the mirror memory, saying "stop playing that rubbish move in that position, play this instead".

It should remember more consistently than you — so watch out.

Figure 1.

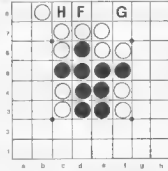
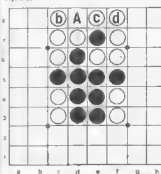
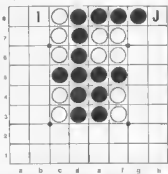


Figure 2

Figure 3



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Graphics



PATTERNS AND PROGRAMS

Constructing patterns is a good way to illustrate how to build programs. Just as a complicated pattern can be developed using simpler sub-patterns, so a complex program can be developed from simpler sub-programs.

In dealing with graphics programming there is direct correspondence between the way in which a pattern is built up and the way the program to draw it is constructed.

For this reason a pattern can actually be seen as a picture representing the structure of the program that drew it.

Making patterns with a micro is also a fascinating way to use it and to show off its graphics capabilities. Random patterns can be generated quite easily, and introductory manuals for many micros contain such programs.

Patterns generated in a systematic and non-random way can also be attractive and interesting. Whether or not patterns have a random element they can be informative, arising

as they do in the simulation of such things as the growth of living organisms and the development of economic systems.

The first requirement in displaying a pattern is to describe it to the computer, and this requires the use of a computer language.

It is possible to describe patterns using Basic and the plotting commands it possesses, but other languages can be more suitable.

For example, a square can be plotted using Basic with the following instructions (or with something very similar involving PLOT).

```
10 MOVE 0,0
20 DRAW 0, 10 : DRAW 10,10
30 DRAW 10, 0 : DRAW 0, 0
```

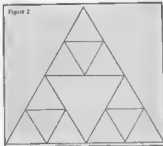
In LOGO (or using 'Turtle' graphics) a square is produced by:

```
REPEAT 4(FORWARD 10 TURN 90)
```

You may agree the Logo description is more natural, giving as it does a direct set of instructions for the following a square which you could actually follow yourself, whereas the Basic description requires a knowledge of where the points such as (10,10) have, perhaps arbitrarily, been placed.

In any event, if you consider how to generate Figure 1 in Basic using a

Figure 2



subroutine for drawing a square as the fundamental building block you may decide that it is none too easy, whereas in Logo it is quite simple.

To build the pattern in Figure 1 from a square, we need a sub-program to draw a square, and in Logo this can be defined by:

```
TO SQUARE
  REPEAT 4 (FORWARD 10 RIGHT 90)
END
```

Using this program, Figure 1 is generated by

```
REPEAT 6 (FORWARD 3 RIGHT 60
  SQUARE)
```

In addition to its simplicity, the construction of this program exactly reveals that of the pattern.

The Logo program uses its sub-program in exactly the same way as a Basic program can use a subroutine. However, Logo can also support recursion, so that sub-programs can call themselves, whereas most micro Basics do not. (Atom Basic and BBC Basic are notable exceptions.)

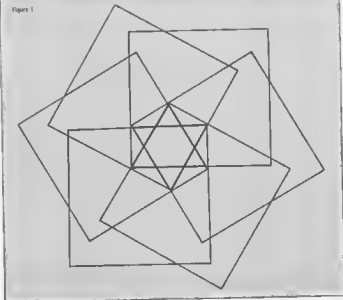
The pattern of Figure 2 can be constructed using recursion. The rule for making the pattern is: Take a large triangle, and at each end of its corners construct a new triangle with half its height, then do the same for each of the new triangles and so on until the triangles become so small that we can halt.

The process has been carried three times in the figure.

The pattern was produced by defining TRIFILL as

```
TO TRIFILL :SIDE
  IF :SIDE 5 THEN RETURN
  REPEAT 3 ((TRIFILL( :SIDE/2) FORWARD :SIDE
  RIGHT 120))
  END
  and then executing
  TRIFILL 24
```

Figure 1



BY GARY MARSHALL

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You may decide to begin with the 16K version. It so, you can still return it later for an upgrade. The cost? Around £60.

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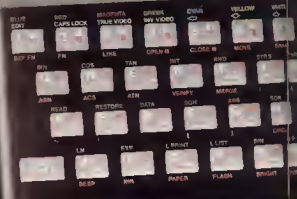
Your ZX Spectrum comes with a mains adaptor and all the necessary leads to connect to most cassette recorders and TVs (colour or black and white).

Employing Sinclair BASIC (now used in over 500,000 computers worldwide) the ZX Spectrum comes complete with two manuals which together represent a detailed course in BASIC programming. Whether you're a beginner or a competent programmer, you'll find them both of immense help. Depending on your computer experience, you'll quickly be moving into the colourful world of ZX Spectrum professional-level computing.

There's no need to stop there. The ZX Printer—available now—is fully compatible with the ZX Spectrum. And later this year there will be Microdrives for massive amounts of extra on-line storage, plus an RS232 / network interface board.



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rum



RS232/network interface board

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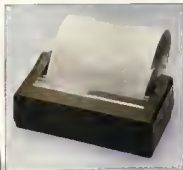
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The ZX Printer— available now

Designed exclusively for use with the Sinclair ZX range of computers, the printer offers ZX Spectrum owners the full ASCII character set—including lower-case characters and high-resolution graphics.

A special feature is COPY which prints out exactly what is on the whole TV screen without the need for further instructions. Printing speed is 50 characters per second, with 32 characters per line and 9 lines per vertical inch.

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All the BASIC commands required for the Microdrives are included on the Spectrum.

A remarkable breakthrough at a remarkable price. The Microdrives are available later this year, for around £50.



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PUZZLER IN CHIEF

Welcome to the first *Computer & Video Games* puzzle page which will appear every other issue with a selection of simple brain teasers and harder brain mangles. These may have you reaching for the trusty computer to help you through some laborious number-crunching.

On some occasions, (the Mastermind puzzle) you will be invited to send in your answer to try to win a prize. Others we expect to be solved quickly.

The resident puzzle master will be Trevor Truran, and we invited him to write a small biography to explain his credentials.

He did! It started: "Age: In three year's time my father's age will be double what my age was two years ago." And then Trevor's natural modesty took over, so we thought we'd better take a hand.

Trevor is a former puzzles editor of *Games & Puzzles* magazine, he now edits *Top Puzzles*.

If you have any ideas for computer puzzles yourself, please send them in to us and we will pass them on to Trevor, he pays £5 for each one published.

Apart from the Mastermind competition, all other puzzle solutions are printed on page 11.

SWORDS OR WORDS

The answer to each clue is a six-letter word and sometimes that word is to be entered clockwise in the cells of the hexagon — starting in the numbered cell.

On other occasions, though, the word to be entered is an anagram of the clue word! (Entered in just the same way).

To help you decide which to use when, the answers have been so arranged that touching cells of neighbouring hexagons will both have the same letter.

One pair has been filled in to give



MASTERMIND COMPETITION

No, don't panic! We are not going to strap you into an overgrown black leather chair and grill you for two minutes on Pre-Dynastic Etruscan Pottery.

All you have to do is crack the codes hidden in these examples of Invicta's classic peg puzzle.

Each picture shows you the position in a computer generated game just before the hidden line is correctly formed. There are six colours to choose from and they may be repeated — though there will be no blanks in the code.

Each attempt has been scored at the side — a black marker indicates that a peg is the correct colour in the right hole; a white marker shows that a correct colour peg is in the wrong hole. A blank shows that

a peg is not the right colour.

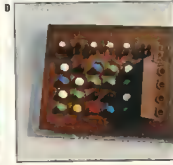
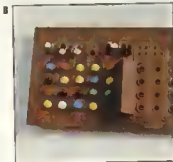
For example: if the hidden code was: red, blue, blue, white. And you tried: red, white, black, blue, the line would show a marker for the

red and two white markers representing white and blue.

When you have used the clues given in each picture, write your answers to the codes on a piece of paper (make sure each answer is correctly labelled A, B, C, D) and send it to: Mastermind Puzzle, Computer & Video Games, Durrant House, 8, Herbal Hill, London EC1R 5JB to reach us before 12 November 1982.

The first three all-correct entries drawn from the postbag will each receive an **Electronic Master Mind** game, donated by Invicta Plastics.

This competition is not open to any employee of East Midlands Allied Press or of Invicta Plastics or their families. The judge's decision, as usual, is final.



you a start. Can you solve the clues, find the words, re-arrange where necessary and put it all together?

CLUES:

1. Seat of royalty.
2. Rounded.
3. Domestic fowl.
4. Short time.
5. Lethargy.
6. Accompany a car?
7. Firearm.
8. Persian governor.
9. Relative.
10. A liaison.
11. At large.
12. Another relative!

ALL BOXED UP

Buying fireworks nowadays is, quite rightly, a much harder process than it used to be. For a start you have to be in long trousers and not speak in a piping treble. And, if you visit the newsagent run by Chas Hands, you would need the mental agility of a mao seen in a night club from a distance — by his wife.

As Chas cheerfully explains: "I sell two boxes of fireworks, each containing 41 items. The first has a mixture of Rockets, Silver Serpents and Thunder-Claps and costs exactly £5.

"In the second there are many Rockets as there are Thunder-Claps in the first. And likewise as many Thunder-Claps as Rockets. Both have the same quantity of Silver Serpents. The second one — Just a little over £12.

"Oh, by the way, five Rockets here would cost you the same as 17 Silver Serpents if you could buy them separately — which you can't!"

How many fireworks of each type are there in the first box and what did each cost?

IAN PEDDER

		APPROACH					EXIT				
		MINI	ROLLS	ROATE	VAN	MAXI	BRASS	GOLD	SILVER	COPPER	LEAD
APPROACH	Miss ELLIS										
	Mr PRICE										
	Mrs DOWNS										
	Mr LUCAS										
	Mr TURNER										
	BRASS										
EXIT	GOLD										
	SILVER										
	COPPER										
	LEAD										
	BRASS						X				
	GOLD							X			
APPROACH	SILVER								X		
	COPPER									X	
	LEAD										X
	BRASS										

Miss ELLIS				
Mr PRICE				
Mrs DOWNS				
Mr LUCAS				
Mr TURNER				

COMING AND GOING

Constable Paynting heaved a long sigh and reached resignedly for his notebook.

It was just his luck to be on duty at the town roundabout when stolen goods were on the move. An informer had called the station and an inspector had called him — a vehicle worth investigating had, sometime that afternoon taken the Lead Lane turning. What, he was asked, did he know about that?

Not a lot, it seemed. The traffic had been heavy, the sun bright and hot. As he struggled to recall the recent past, he made notes of the vehicles and locals he knew well who had been in the area.

1. Mr Turner, who did not drive a Rolls, exited down the road immediately to the left of the one he entered along.
2. It was a woman who met the roundabout from Cold Hill but the Mini which left at Brass Way.
3. Miss Ellis left by way of Silver



Street but the Estate turned off at Copper Row.

4. Mr Price, in his Maxi, took the first turning off, which wasn't Lead Lane or Copper Row
5. Neither Mrs Downs' Van nor Mr Lucas used Copper Row or Silver Street.

Here Paynting paused and reluctantly prepared himself for an apologetic meeting with his superiors.

Perhaps you can do better by naming the driver of each car, the road it arrived by and the one it left by and so be able to say which car and driver should be investigated.

To help you sort out the facts, the grid can be used: enter a/for a positive piece of information and a X for a negative one. Of course, no driver arrived and left by the same road.

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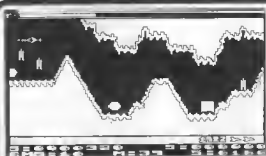
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VIC-20



Kit Korner

GOODBYE TO ALL THIS...

As this is going to be the last time that Kit Korner will appear in this form I will use this opportunity to review the previous 12 issues and to relate to you some of the points I have learnt from writing them.

It may come as a surprise to know that I have probably learnt more than anyone who has come to me with a problem will ever learn, in the last year, about kit building. I should therefore like to thank all of those people who made so many blunders and kept me busy trying to solve them.

From the very beginning I assumed that most of my readers knew little or nothing about construction as this was the best way of reaching everyone. I progressed as time went on to consider some of the more complex aspects of the art.

These I tried to explain in the simplest terms so that they followed through from the previous articles. From the limited responses I have had this worked quite well. Some readers and friends, however, who already had considerable experience in this field were only really interested in the specific hints I had to give. So, altogether it worked quite well. Now here, and hopefully not in list form, are some of the more important points which I learnt from writing this page.

As a result of reducing production costs the difference in price between kit and ready built models has been reduced to a point where, to a kit builder, it is tempting to buy the ready built model.

I would still not do this, as to reduce the cost involved it appears that the manufacturers have failed to maintain quality. This is apparent in many of the newer models. It is therefore a great pity that so few micros are offered in kit form.

Even when complicated modifications are required for, let us say, a screen memory expansion I would prefer to buy the circuit diagram from the company involved at the modification price and do the work myself.

I feel most strongly that it is essential to know how your machine works if you are going to use it to the full.

Also, I would not undertake to build a kit with only assembly instructions. As shown with the early ZX81 the instructions were at fault,

at one point, whereas the circuit diagram was correct.

I am very fortunate in having access to a complete tool kit and workshop which I have found indispensable when it comes to construction. This is also part of my job function anyway, so I am doubly fortunate.

At one stage I outlined the minimum tool kit and later went on to fill it out somewhat. I discovered later that I should not have recommended the minimum version but should have gone for something a little larger.

I hope that if some people did try to build a kit with the minimum of tools that they managed I have heard no complaints.

Another field that I am fortunate to be a spectator in is that of add-ons. Although I have not built many of these they are usually so simple as to draw no comment.

The kits that are more complicated normally arrive with well-written instructions and are so numerous that it would require the whole of this magazine to list them, let alone review them all. The only point that comes to mind here is to make sure that the kit does come with a full set of instructions and diagrams.

If they do not you should ask for them as a condition of purchase saying that you do not consider the kit complete without having them.

Be a little wary of kits that either originate from abroad or, worse, are mailed from overseas without there being an office in this country.

Not all, or even many, are pirates but someone will be unfortunate and find one that is. The only thing to do is to inform the Director of Fair Trading and all the magazines you care to. You may be lucky and with the possible help of others be able to salvage something from the kit. I sincerely hope that no one does discover a pirate the hard way.

I did not, at the very beginning, believe that I "knew it all" and did consult as many of my friends and colleagues as I could to find out their opinion which has proved useful in many instances.

Unfortunately many of the mistakes I have come across could have been avoided so easily if the offender had consulted someone with a little more experience for just five minutes.

I have stressed the point in the past that if you feel uneasy about some aspect of kit building, stop and consult someone about it. Even contact the suppliers if need be. They will be only too grateful to you for bringing the difficulty to their attention. I am afraid that this will not be the last time I will mention this though.

I hope that this page has been of some help to those who have begun kit building and that you have enjoyed it as much as I.



BY KEITH MOTT

UNDESCRIBABLE! UNBELIEVABLE!

Cosmic Swarm

Having to wait four months for his BBC Micro was hard luck for top programmer Mike Chalk, but it was certainly good news for Tandy/Genie owners, for he spent the time creating his last Arcade game for these machines, and of course exclusively for Kansas.

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Adventure

THE YEAR OF ADVENTURE

Well, here we are one year later and still going strong! Adventure is as popular as ever, with an increasing variety of games on the market for every conceivable machine.

In the course of the next year I hope to tell you what it is like to play Adventure on a PDP-11, introduce you to Caplano 80's Book of Adventure, and give you an assessment of what appears to be the Adventure programmers' "last one".

In the meantime here's an "end-of-term" exam to see whether you've been paying attention to what

I've been telling you over the past year. All the questions can be answered by reading the Adventure pages in the past years' issues of *Computer & Video Games*.

ADVENTURE QUIZ

1. What advantages does a machine-code Adventure have over one written in Basic?
2. In what Adventure might you find patches of oily slime?
3. What could give you heartburn if your stomach was grumbling?
4. Who are you likely to find following you around in a pyramid?
5. Why would a telescope prove

useless on Wizard's Mountain?

6. If you were a Hellfire Warrior, name two monsters that might trouble you.
7. IF: Black Red = Sceptre AND: Small Bird = Bird Statue THEN: What is equal to Wicker Cage?
8. What often covers you of the top of an extinct volcano?
9. What keeps telling us my head in the Asylum?
10. Who have delicate ears?
11. In what Adventure would you find yourself in the role of a journalist?
12. What words would you use to get through a hole in the wall in an old Manor House?

THE NOT SO INSTANT KARMA...

Having treated my micro to a memory upgrade recently, I was quite impatient to try out a big Adventure on it, so I decided to see if I could lose my way in "Lords of Karma".

The game opens in the city of Golconda which is surrounded by mountains and forests. Sunlight filters softly through the leaves of Aspen, Oak, Redwood and Pine, to help guide you through the paths and clearings that abound. You will have a long journey, for I estimate that there are upwards of 100 locations in the game.

Your aim is to collect as many "Karma Points" as possible. These are obtained by carrying out brave and kind deeds.

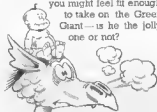
Some deeds, of course, are braver and kinder than others, so you might be easily misled into thinking that because you had gained points, you had performed the right deed in the right place with the right equipment. This is not necessarily

so, and a similar act in a different scenario might have proved more fruitful.

Therefore, to achieve a high score, once you have made an initial exploration, the game is best played in sections before tying the whole thing together.

For instance, today you might try to collect a few goodies together and spend your time in retreat at the Chapel of Prayer, whilst tomorrow

you might feel fit enough to take on the Green Giant—is he the jolly one or not?



If your wife, girl friend or mother needs a new handbag why not organise a trip to the cypress swamp and go crocodile hunting? Or perhaps carry out one of the special quests set you by the folk you encounter?

I hope I have conveyed how diverse this game is. It is also quite user friendly. The conversation with the computer scrolls, telling you where you are without filling the screen with unwanted detail unless you request it with "LOOK".

A typical response might be: "Up the sky. Down the ground. North a gate. South a path. East an unclimbable mountain. West forest. You are on the Trail of Tears."

My only complaint with the dis-

play was the lack of a cursor. It is impossible to tell whether or not you have hit the space bar during input, whether deliberately or accidentally.

Since the game is so large I know not what the highest score is, if indeed there is an absolute maximum. The highest I know of so far is 887, a total reached by Duncan Wood of Chatham, a friend who helped me cover the ground in time for this review.

If you've achieved a score higher than that let me know, and I'll keep a high-score tally running on this page!

Lords of Karma is supplied on a cassette containing a separate recording for each of the four machines. These are listed together with the memory requirements of each, in fig. 1.

The game is published by Avalon Hill and is impressively packaged in a deceptively large box.

It is available from Calisto Computers, to whom I offer my thanks for the review copy.

ANSWERS TO QUIZ

1. (a) Less memory consuming (b) Executes faster 2. Adventureland (Scott Adams) 3. Eating Snakes (Brahmazz 5000, Frank Cort) 4. A small mound (Pyramid of Doom, Scott Adams) 5. Falls in pieces (Wizard's Mountain, Jeremy Zornoff) 6. (a) Giant Red Ant (b) Giant Tick (Hellfire Warrior) 7. Slime 8. Sweat (Savage Island #1, Scott Adams) 9. A pine (Asylum, Frank Cort) 10. The Owners of the Room (Frank Cort) 11. Time Machine (Brian Howarth) 12. CLIMB THRU HOLE (Crowing Manor, Lynn Pearson).

Figure 1. Machines and memory requirements for Lords of Karma

MACHINE	MEMORY
Atari 400/800	40K
Apple II	32K
Pet 2001	32K
*TRS-80 Level II	48K

*The same recording is also compatible with the TRS-80 Model 3.

By KEITH CAMPBELL

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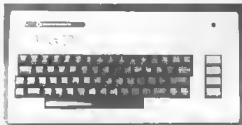
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PRACTICAL PROGRAMMING

THE STONE, PAPER, SCISSORS GAME

In the last 40 years or so there has been a great deal of work done on the mathematical theory of games. The interest in the subject is due mainly to applications in economics and warfare, but the theory does have applications in game playing, and the ideas and terminology came mainly from such games as chess, bridge and poker.

Although the theory of games involves some very difficult mathematics it is possible to understand and use some of the simpler ideas without any knowledge of advanced mathematics.

Let us begin by looking at two very simple games, Matching Pennies and Stone, Paper, Scissors.

In Matching Pennies the two players, A and B, simultaneously lay down their coins; if the two coins both show heads or both show tails, A wins; if the two coins show different sides, B wins.

In Stone, Paper, Scissors, the two players hold out their hands simultaneously, with a closed fist for stone, a fully extended hand for paper, and two fingers extended for scissors.

The winner is determined by the scheme Stone blunts Scissors, Scissors cut Paper, Paper wraps Stone, while if both players show the same the game is a draw.

We can represent these games by the following tables:

Table 1: Matching Pennies

	B	
	Heads	Tails
A Heads	1	-1
Tails	-1	1

Table 2: Stone, Paper, Scissors

	B		
	Stone	Paper	Scissors
A Stone	0	-1	1
Paper	1	0	-1
Scissors	-1	1	0

The entries in the tables represent A's winnings, so that a positive number means that A receives a payment from B and a negative number means that A makes a payment to B.

We can now imagine the games being played by A choosing a row from the table and B choosing a column, the result being determined by the entry where the chosen row and column intersect.

Taking this view of a game we can start by drawing up a table at random and defining a game by the table. Consider the following table:

Table 3	B			
	1	2	3	4
A 1	3	2	-3	-2
2	1	3	2	-2
3	2	4	2	1
4	-2	1	3	0

If A chooses row 2 and B chooses column 1, A wins 1; if A chooses row 2 and B chooses column 4, B wins 2, etc.

In all these games, A and B make their moves without knowing what the other is going to do; if either player knew the other player's move before making his own he could always win. For example, in Matching Pennies, if A knew that B had played heads, A would also play heads and win.

MAKING RANDOM CHOICES WORK

In any game, we expect that there is some "good" way of playing that will give a better result than unformal play.

In Matching Pennies and Stone, Paper, Scissors, it is clear that if our opponent knows what we are going to do we will lose, so we must make some random choice; it is also fairly easy to see that in both these games the best way to play is to make all the choices equally likely.

For example, in Matching Pennies the best strategy is to play heads 50% of the time and tails 50% of the time, at random. If one player does this he will, on average, win half the time and lose half the time, regardless of what the other player does.

However, if one player deviates from the 50-50 random play and the other player catches on to what he is doing, he can adjust his play to

give himself a better chance of winning.

Suppose that player A chooses heads twice as often as tails; if B discovers this he can win by choosing tails twice as often as heads, since in this situation, out of every nine plays we will get, on average, two heads twice, two tails twice, one head and one tail five times.

Thus B will win five times for each four times he loses, and in the long run will come out ahead.

In general, if A plays heads and tails at random, but with different probabilities, B can win in the long run by using the same probabilities but switching them from heads to tails and vice versa.

Program 1 plays Matching Pennies in this fashion. The variable Q is used for the probability that the program will play "tails", and is initially set to 1/2.

The program keeps count of the number of times the player has chosen heads and tails in the variables NH and NT, and after 10 games Q is recalculated and set equal to the probability that the player has been using for "heads".

Of course, playing at random with probabilities different from 1/2 is not the only way of deviating from the best strategy if you play heads and tails equally often but in a regular sequence, such as H,T,H,T... or H,H,T,T,H,H,T,T... your opponent can win by learning the sequence and playing accordingly.

The program could be modified

```

5 REM MATCHING PENNIES
10 LET Q=1/2
20 LET NH=0
30 LET NT=0
40 LET PS=0
50 LET NS=0
60 LET N=0
70 PRINT "YOUR MOVE H OR T"
80 INPUT P$
90 IF (P$="H") AND (P$="T")
100 THEN GO TO 200
110 IF P$="H" THEN LET NH=NH+1
120 IF P$="T" THEN LET NT=NT+1
130 PRINT "MY MOVE"
140 LET CS="H"
150 PRINT "YOU PLAY "P$
160 PRINT
170 IF P$=CS THEN GO SUB S00
180 IF P$=CS THEN GO SUB S00
190 PRINT "MY SCORE "CS
200 PRINT "YOUR SCORE "P$
210 GO TO 80
220 REM COMPUTER UINS
230 PRINT "UIN"
240 LET CS=CS+1
250 RETURN
260 REM PLAYER UINS
260 PRINT "YOU UIN"
270 LET PP=CS+1
280 RETURN
290 REM COMPUTER S MOVE
3000 IF N10 THEN GO TO 1100
3100 LET CS=CS
3200 LET CS=CS
3300 IF CS=10 THEN LET CS="T"
3400 RETURN

```

BY TED BALL

PRACTICAL PROGRAMMING

to handle this situation, but it would be very difficult to write a program capable of detecting more than the simplest sequences.

If we return to the game defined by Table 3 we find a completely different situation. In the case of Matching Pennies and Stone, Paper, Scissors, we could work from the original forms of the games, or from the symmetry of the tables, but here we have an apparently random collection of numbers and no "original" form for the game.

There is a way of finding the best play in this particular case, and to understand how it works it is easiest to start by imagining that B plays first and A plays knowing B's move.

If B chooses column 1, A will choose row 1, because the 3 in row 1, column 1 is the largest entry in column 1.

If B chooses column 2, A will choose row 3, because the 4 in row 3, column 2 is the largest entry in column 2.

If B chooses column 3, A will choose row 4, because the 3 in row 4, column 3, is the largest entry in column 3.

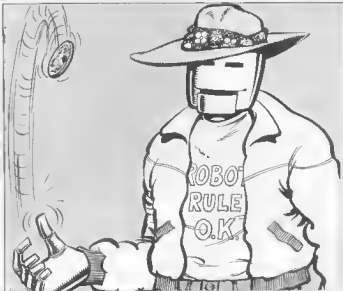
If B chooses column 4, A will choose row 3 because the 1 in row 3, column 4, is the largest entry in column 4.

B can work this out in advance, so he will know that if he chooses column 1 he will lose 3, if he chooses column 2 he will lose 4, if he chooses column 3 he will lose 3, and if he chooses column 4 he will lose 1. From this it appears that his best play is to choose column 4, as this gives him the smallest loss.

If we now change round and imagine that A plays first and B plays knowing A's move, we can go through a similar procedure, but this time B will be choosing the column containing the smallest entry.

Summarising A's strategy, if he chooses row 1 he will lose 3, if he chooses row 2 he will lose 2, if he chooses row 3 he will win 1, and if he chooses row 4 he will lose 2, so it appears that his best play is to choose row 3.

In both cases we end up with the same choices, row 3 from A and column 4 from B. This does not



Next month will be the first time you will see Practical Programming. Our expert programmer Ted Bell is not leaving us however — he is simply turning his typewriter to other things. He is going to write features on machine code, the first of which will appear in our January issue.

happen with every table (see what happens when you use this procedure on Tables 1 and 2).

The reason that both ways of working towards the solution give the same result is that Table 3 contains an entry that is at the same time the largest number in its column and the smallest number in its row.

In the terminology of game theory, an entry in a table that is the maximum of its row and the minimum of its column is called a *saddle point*. Thus, Table 3 has a saddle point at row 3, column 4, while Tables 1 and 2 have no saddle points.

In the situation of Table 3, where the best play is always to make the same choice, this choice is called a *pure strategy*, in the situation of Tables 1 and 2, where the best play is to make a random selection among the possible choices, the play is called a *mixed strategy*.

WHEN THERE IS NO SIMPLE WAY . . .

The two games we have looked at that lead to a mixed strategy are easy to solve because of their symmetry. However, in more complicated cases it is not possible to find a solution by simple inspection as we were able to do with Matching Pennies and Stone, Paper, Scissors.

Table 4

		B		
		1	2	3
A	1	-1	1	1
	2	2	-2	2
	3	3	3	-3

Table 4 has no saddle point and there is no simple way of finding the probabilities that give the best results for A and B.

There is a mathematical method that can be used on tables of any size and shape, but it is not easy to understand.

However, the mathematical method is not the only way to find the solution, and I will be continuing next month, describing a game which leads to Table 4 and explaining how to write a program that will "learn" the best solution.

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GETTING THE MOST FROM YOUR MICRO?

These days, there seem to be new developments in micros every five minutes. How can you stay in touch? Which Micro & Software Review brings you all the most important news and the most interesting facts every month.

As well as our unique buyers guide to software packages (which is updated every month) we review software in depth. This month we analyse PLANNERCALC and tell you whether its low cost represents good value, and how it stacks against VISICALC.

We also take a long look at the new cash flow forecasting package CASHFAX. Every month we tell you what's available, what's in the pipeline and what's right for you—over a range of software for home, business and school users.

We don't stint on hardware coverage either. Not only do we publish the most extensive buyers guide available (over 100 micros in detail) but we also publish reviews that really take machines apart. This month



we put two British micros under the microscope—the new 64K MIMI 802, which made us wonder whether British could be best again. And the £89.95 JUPITER ACE which is not only very cheap, it's also the world's first micro to use FORTH. Does that make for speed, versatility and ease of programming—or should it have been left with the mainframes?

With all this you get the best news, an informative (and fascinating) letters page, and a problem-solver section written by two of the most respected experts in the business. November's issue is at all good newsagents from October 15th. Don't miss it.

THE A TO Z OF MICROS

**WHICH
MICRO?
& SOFTWARE REVIEW**

C.P.S. GAMES

ADVENTURES HASHA THE THIEF

Try to steal the Pharaoh and steal the golden statue of the Great Sphinx. There are not only traps and pitfalls but even some magic lying to stop you from getting to the pearly throne.

THE WIZARD OF SHAM

If you can't find the hidden-out then he will give you the story of his. Travel through the jungle, the ghost town of Sham and find the secret entrance to the temple, in which the wizard lives. Once in the temple you will need all your skills and determination to avoid the dangers awaiting you. You may meet the wizard in the end, but we doubt it.

THE FOURTH KIND

Can you manage to cure a girl who has the astra disease and obtain from them the universal machine for eternal life? This is not only an adventure but we test also your skills in trying to overcome what it would seem to be impossible communication problems.

THE 7 CITIES OF CIBOLA

These legends claim where the Spanish Jesuits found their gold are situated somewhere in the South American jungle. Their whereabouts have been lost for several centuries, and nobody has found them ever since. Can you survive in the exhausting climate and find at least some treasure? And if you find it, will you still be strong enough to get back with your gold? There is not only the climate, Indians, poisonous animals, secret religious sects and many more.

THE DOMED CITY

You are travelling through unexplored territory and your way is blocked by a giant ant heap. By a trick mutation these ants are as big as you and there is only one way down through the ants' lair. Some ants are friendly others are aggressive, and your weapons are not much help. Your survival depends on skill, anticipation and cunning. Will you succeed?

THE TOWER OF BRASHT

One member of your expedition has been taken prisoner by the Khazars, a cruel tribe living near the edge of our nation. You must choose a few Centipede from your team and try to get the prisoner out. Success or failure will depend on whom you choose and how they are equipped. This Q&D type adventure is a difficult and will take you some time to play. It can be used as a roleplaying adventure with as many players as there are members of the team.

THE GHOST OF RADUN

In the big hall, under the castle of Radun, a huge treasure is buried. Many have tried to find it, but none have ever returned to tell the tale. It is rumored that the treasure is guarded by a ghost who appears when least expected and makes sure that the treasure hunter can no longer return. This adventure is definitely not for the weak hearted and we strongly advise not to play it after midnight, especially not when you are alone in the house.

ADVENTURES FOR THE VERY YOUNG:

There is a longer list of very young children to gaze avidly at a computer they are not allowed to touch.

The new series of adventures is mainly based on graphics, but follows the traditional pattern of an adventure game. There are some explanatory instructions for which a lot of help from the grown-ups may be needed. If you want to see some little eyes light up.

PETER RABBIT AND THE MAGIC CARROT

Peter Rabbit goes, at a goad, at the magic carrot. It is rumored that any rabbit taking one bit of that carrot gets an extra twenty years of life. Peter has to go through the big forest, mean men (and not so mean) hermits, deals with a dwarf, gets help from his mother, and so on. What he has to do is to get the carrot and find the magic carrot.

PETER RABBIT AND FATHER WILLOW

Father Willow has been damaged by vandals, and is now in a bit of a state. Peter Rabbit goes in person to the vandals. They know and by no means to be a waste but to stop Peter Rabbit from following them. Luckily the latter gets help from the other boys, who heard about the story. But will he find the vandals and have them locked up?

PETER RABBIT AND THE NAUGHTY OWL

After the Owl has been overthrown of life, the Lord of the Meadows sends Peter Rabbit on an expedition to find the Master of the Owl, in order to have Jimmy taught some manners. The Master lives very far away and it is quite an adventure getting there. Will Peter Rabbit come back without having seen the Master and thus Jimmy remain a nuisance?

In how languages the Peter Rabbit Adventures can be dangerously addictive in your life.

FRUSTRATION

Frustration is more a puzzle than an adventure. It looks like a program full of bugs and nothing seems to work. It will be difficult to get to the end, but if you do (and don't go mad with frustration) then there is a reward. The best part: correct answers received by us will be allowed to choose three of our games. FREE!

WAR GAMES

All with full graphics of the battle field, and inclusive of manual.

KING ARTHUR

It is in the 14th century, the ANGLES and SAXONS are marauding through the Country, leaving behind a trail of blood and devastation. In the South a man is gathering troops and fighting them off. His name is Arthur. You take his role in this fascinating warfare. Will you be able to win all the battles he won and take Britain from the pursuing marauders? Now it's up to you at commanding troops, finding the enemy and being first to battle, using information, seeing through the fog of war, deciding on a troops and many more similar stuff.

BATTLE OF THE BULGE

Armies 1944, the famous von Rundstedt offensive.

BATTLE OF THE RIVER PLATE

A simulation of the well known sea battle.

CONVOY

You are the commander of a convoy under attack from submarines. Instant decisions are required and if you hesitate too long the damage might be done. Try and locate the enemy and destroy them. Not easy. Again graphics, but combined with verbal information.

All these games are available for ATARI and need 16K RAM.

Some of the games will load different programs successively and are thus much larger than 16K.

All C.P.S. Games except those for children are priced at £9.50. The Peter Rabbit and Tummy Digs games are now £4.50.

C.P.S. 14 Britton St., London EC1M 5NQ

We are in the process of moving. Mail will still be received at the above address and telephone messages taken. Our new address and telephone number will be announced in the next issue.

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PIMANIA

Pimania is an aptly named computer adventure game. It sends players around in circles and quite probably turns them manic.

But with a specially commissioned gold and diamond sculpture valued at £8,000 on offer as a prize, it is well worth the risk of trying to discover its secrets.

The adventure comes in cassette form for the 48K Sinclair Spectrum — although there are plans to put it into other computers in the new year — and is the brainchild of Portsmouth-based software house, Automata Cartography.

The idea follows the formula of the successful Kit Williams' book, *Masquerade*, which challenged readers to use clues in the book's illustrations, to discover the whereabouts of a jewelled hare which the author had buried at a secret location.

Automata's prize is the Golden Sundial of Pi and although it is still in the designer's studio, we will bring you a photograph of it in our next issue.

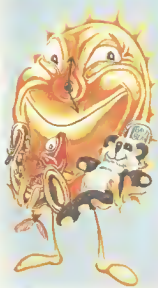
The sundial will not be hidden away but would-be solvers will have to sift through the numerous clues in Pimania to discover the "time and place" where it is metaphorically hidden.

The first person to get in touch with Automata and give the correct solution, wins the Golden Sundial. But the company's managing director, Mel Croucher is confident that it will be several months before anybody cracks it.

He told us: "You go through a series of Gates of Pi and the last one reveals exactly what we want by way of a solution. We are not encouraging people to start digging things up but hope they will meet us at the correct time and place."

Purchasers of the £10.00 cassette face their first puzzle almost as soon as the game has loaded—how to get started? The computer screen explains that one key will activate the game but then it's up to the player to press the right combination on the keyboard. I ended up going through the keys systematically before the obvious struck me.

A specially commissioned £8,000 prize provides the best evidence that computer gaming has come of age. The Golden Sundial of Pi is the prize destined to grace the mantelpiece of the first person to solve an elaborate computer adventure, Pimania. TERRY PRATT tried his hand at Pimania — and from his report his mantelpiece is likely to remain bare.



But after that hunts and clues are liberally scattered in an Adventure enthusiast's dream of frustrating mazes, unlikely treasures and abrupt dead-ends.

Every time you stop and start again the treasures will be redistributed around the maze — but you can save the game during a successful run.

There is also an entertaining array of responses to the sort of desperate drivel which adventure games usually reduce me to, the: "Help! I can't take any more! Let me out!", variety. The sense of humour is strong throughout and belongs to programmer Christian Penfold.

He is also responsible for some ingenious graphics routines and sound effects which chart the player's progress through the Pimania realm. Acting as the guide is a cartoon character called the Piman. I couldn't work out whether he was a friend or foe. He has a good line in merry quips, a penchant for collecting some bizarre items and the ability to double up as a very able chorus girl.

The program is written mostly in Basic and there are no elaborate precautions to prevent people listing it. But Mel Croucher is convinced that there are no short-cuts to the solution in doing this. He says: "If people want to work out the puzzle by wading through masses of code, they are welcome to try."

Part of the charm of *Masquerade* was Williams' insistence that the clues were just as accessible to a child's mind as an adult's. Croucher claims that this holds true for Pimania and another important criteria is that even after the competition has been solved, the owner still has a playable and well-presented game for his money.

Automata launches the game in mid-October and will be displaying the Golden Sundial at computer exhibitions.

Despite my own failure to discover the solution, I am keen that Computer and Video Games should share in the glory of winning the Sundial.

To this end we will be referring readers' Pimania letters to Automata and hopefully printing any tips or helpful hints in our Mailbag section. So please write in if you think you can pass on something useful and perhaps the combined might of the C&VG readership can resolve the puzzle of Pimania.

The only tips I can offer are:

- Look for clues even in the instructions.
- Take a pencil and paper around the maze with you and map it out.
- Dismiss nothing in the program — even the music should be noted down — it could be significant.

Good luck and watch out for red herrings!

1 NORTH POLE
ARCHER CIRCLE
THE WORLD

Dear Sir,

Many of my regular customers are putting in most unusual orders this year. I have had requests for Genie's, Dragons, Atoms and all sorts. Some gentlemen called Vic seems to be in great demand too. This electronic age has left me longing for the old days when dolls and toolbells seemed to be the rage and made me feel quite old fashioned.

Yours truly,

John J. ...

... that when a young

It's got to be the stage that when a young kid asks for a Pat, I hesitate to drop him a puppy! Could you help by pointing out the top selling computers this Christmas and giving some tips on how to go about buying them — my sales will have to work out some kind of wholesale deal I imagine.

If you could take the trouble to
old man up to date I would be very
grateful
Yours sincerely,
S. Cline

Previously the undiscovered microcomputer, the Texas Instruments TI 99-4a now seems to be establishing itself in the home market, a year after its launch.

This computer was one of the first into the high street at outlets like Rumbelows but its recent price drop to £199 has made it much more competitive.

It has an adequate type-writer style keyboard and a readable 24 line by 32 character display on any domestic TV set. The manual is well thought out with a quick reference chart and will take the beginner into such computer mysteries as user-definable graphics without too much difficulty.

The 16 colours are more than can usefully be utilised and do have a slightly muddy quality. But it can produce a wide range of

sounds, ranging from white noise to pure tones

The Texas software market is only just starting to get off the ground with several companies set up to distribute US software over here and a small number writing their own programs.

Texas itself is a huge US computer concern which made its name manufacturing computer chips and has a good slice of the calculator market. It is backing the machine with some cartridge software which plugs into a socket on the machine's console.

The 16K memory included in the basic machine can be expanded up to 48K and the Extended Basic cartridge which introduces SPRITES, movable graphics characters is a worthwhile buy for the games programmer.

Disc drives and a printer are also available from Texas, as are joysticks.

The Texas comes across as something of a rogue microcomputer, using a Basic all its own and has several other peculiarities which set it apart from rivals. But with software backup and the new low price it should sell well.

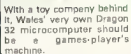
The Vic-20 will be one of the most readily available microcomputers on sale this Christmas.

It can be bought in most high street branches of Boots, Dixons, Rumbelows and Currys — plus computer specialists — for around £169.

A compact computer with a moulded typewriter style keyboard, which gives it an advantage over rivals like the Ateri 400 and the Sinclair duo, the Vic works with an ordinary domestic TV set.

It comes with a manual written for the computer newcomer with examples and exercises but the old hand will find a lot of his questions unanswered. It does explain how to use the eight colour display and impressive four-voice sound facility.

The usable memory is 3½K which does not compare well with recent additions to the market and it has a disappointing screen text display of 23 lines deep by 22 characters long.



It is! But despite all the careful thought that has gone into it, there are reservations. It is a compact computer with a typewriter keyboard which utilises a normal domestic TV and cassette recorder.

With 32K memory, colour graphics and sound for only £199 it also sounds a good buy.

It uses the 6809E microprocessor and much of its games software has been converted from the closely related Tandy Colour Com-

The computer comes from the well-established US micro manufacturer Commodore which is backing it with a large range of peripherals, disc drives and a printer end, unusually some high-quality games.

This comes in both the common cassette form and cartridges which plug into the back of the micro. These have the advantage of adding the necessary extra memory to the Basic machine to give good arcade quality games but cost upwards of £17.

Games-playing aids like joysticks and paddles, plus printers, disc drives, memory expansions and light pens are available from Commodore and independent sources.

The Vic is a reliable loader of cassette software but you will need to buy the Commodore recorder (cost £44) to use with it.

The low basic memory and cumbersome text display give the year old Vic a dated look but it has some high quality games software available.

puter. As it is such a new machine what software there is comes from the manufacturers.

Dragon Date is a subsidiary of Mettoy, toy company and the emphasis has been put on the computer being a family acquisition.

The ports and sockets are all clearly marked and the manual gives a clear diagram showing how to set it up. The manual tries valiently and should help most beginners into understanding the beast.

There are nine colours on the Dragon 32 and it offers a comprehensive variety of musical options. There are five levels of graphics re-



COMPUTER CHOICE



solutions enabling the user to draw lines, arcs, circles and utilises a PAINT operation for solid areas.

The display uses only a small area of the TV set and does look rather twee, although it manages 16 lines of 32 character text display.

On paper the Dragon sounds a marvellous machine but so far the software has seemed unimpressive and it has not been around long enough to prove that really good games can be put on it.

BBC MICROCOMPUTER MODEL A & B

The BBC Microcomputer has had a troubled first year since being launched amid glowing reviews last January.

Rushed out to coincide with a BBC television series, it did not have a proper introduction manual. Its manufacturers underestimated the demand for the Model B version and too many purchasers spent too long on the waiting lists.

Now a comprehensive user manual is being sent out, the waiting lists have been cut, but it is possible to by-pass these entirely by going to specialist dealers like North London-based Microage.

The BBC is a large flat microcomputer which boasts a robust typewriter style keyboard which will please the typist. It has a

claimed 16 colours include several that are just flashing combinations of the basic colours but combined with the high resolution possibilities and good sound quality, the Model B offers games software which is as playable as the arcade originals.

So far BBC software has been slow to develop, but those games which have been produced are fast and impressive.

The Model A has 16K of usable memory and the Model B 32K and they cost £299 and £399 respectively. The A also has only four graphics modes and its games software is more limited.

The BBC Basic is highly rated as Microsoft compatible but including much more. It has many commands (like automatic line



powerful cassette interface and seems to load and save programs from the most elderly and decrepit cassette recorders.

The graphics are available in eight different modes on the Model B machine. Each offers a different resolution and text display. The

numbering and renumbering as standard which other computers only offer as a programmer's aid "toolkit". Its strong points are its loading reliability, a strong Basic and good graphics. On the minus side, it is a complicated machine for the beginner to get the most out of and it so far lacks much in the way of peripherals



ATARI 400 and 800

The Atari range of computers is establishing a firm hold in the UK market — and will be a top seller this Christmas.

There are two models on sale, the 400 which costs £199 and the 800 at £599.95.

Both the 400 and the 800 have many features in common. The machines have very highly regarded graphics capabilities — with 29 graphics keys, and 16 different colours with 16 intensities, which simply means the machines are capable of producing a very good game of Space Invaders.

Games are a good starting point for the Atari computers as there is a rapidly expanding number of games available — mainly imported but some home produced — for the 400 and 800. Many of these games are of exceptional quality and very well known, such as Pacman and Missile Command. Joysticks and Paddles are also available.

Programs can be loaded into the 400 from cassette or plugged directly into the console for the cartridge programs. The 800 can be connected to a disc drive unit which is also manufactured by Atari.

Extra memory can be added by installing either

the 8K or 16K memory expansion unit. There are three different printers available for the 800, and two for the 400. Modem devices are available to enable you to gain access to telecommunications information networks.

The basic differences between the two machines are that the 800 offers you an electric typewriter style keyboard whereas the 400 has the touch-sensitive keys.

The 400 has only two languages which can be used — Basic and Assembly language — the 800 is compatible with Extended Basic, Pilot and Pascal.

Both machines are good teachers. The sound capabilities plus the instruction manuals and tapes teach you computing, illustrating points on the screen and speaking to you in synthesised speech. The Basic program, however, does not come with the Atari 400 but has to be purchased separately at approximately £50 which includes two instruction manuals. There are a number of other educational packages available.

The Atari 400 is a good family computer with impressive games and educational packages available in quantity. The 800 is probably over-priced.

ZX SPECTRUM

The Sinclair ZX Spectrum is building on the incredible success of the ZX81 and is destined to be a big seller this Christmas.

This is despite the fact that it is only available through mail order from the manufacturers. It is undoubtedly a bargain price at £125 for the 16K model and £175 for the 48K version.

The tiny computer features a push button, calcula-



Continued on page 89



TI's Home Computer. Unbeatable value. Unrivalled software.

When you choose a TI Home Computer you're choosing a "real" computer. A computer that can grow with you and your family. A computer that lets you play, invent, discover... that lets your imagination soar.

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When you want to learn to

program for yourself, the TI 99/4A is ready too. TI BASIC is built in. The programming manual is easy to understand, easy to follow every step of the way. You will be amazed

to discover how much fun programming can be.

And when you're ready to expand your system, we're ready too. Our unique Peripheral Expansion System can house up to seven peripherals without extra cables or clutter. There is even a speech synthesiser that gives your computer a voice.

Sound impressive? Try the TI Home Computer for yourself at your nearest dealer. At around £200 you'll look no further.



WHAT THE PROFESSIONALS LOOK FOR IN A HOME COMPUTER

Feature		Texas Instruments TI 99/4A
Microprocessor	TMS 9900 16 BIT	
Graphics	16 colour, high resolution	
Languages	TI-BASIC (built-in), extended BASIC, UC-ND - PASCAL, TH-LOGO, Assembler	
Memory	16K RAM standard—expandable to max ROM/RAM of 112K	
Keyboard	Full size, standard typewriter style	
Software	1200 programs to choose from worldwide	
Solid State Speech Capability	Yes	

TEXAS INSTRUMENTS

SANTA'S CHOICE

Continued from page 87

tor-type, keyboard with one key word entry which takes some getting used to.

Sinclair Research is Britain's low cost computer specialist, now with several years of mail order experience behind it. The company does not usually write its own software but a huge cottage industry has built itself around the Sinclair name.

These come in cassette form and the Spectrum is a far better loader and saver than its predecessors with a VERIFY command ensuring that a program has been properly saved.

Sinclair also scores on the peripherals side with a cheap printer, £69.95, and the promise of ZX Microdrives, around £50, to come.

The Spectrum is an innovative but unpretentious computer which will quickly enjoy a vast and competitive games software library. Many people will find the small button-like keyboard an irritation and on any benchmark it will prove a slow runner.

Editor's reply: In response to your query Mr Claus, I have outlined the seven machines which we expect to be the top sellers this Christmas.

If your elves in the ordering department have any difficulty with some of the terms we have used, I have incorporated a small glossary of terms, which should help in understanding the kind of jargon which computer adverts and salesmen have a tendency to lapse into.

As this is such a fast-growing market there are several machines which are coming out between now and Christmas, or have already been announced and may seem worth waiting for, even though they are not due in the shops until early next year.

SINCLAIR ZX81

The Sinclair ZX81 is still the cheapest introduction to microcomputing it is possible to get in this country.

Now available at £49.95, the ZX81 is no longer limited to mail order purchasers.

For your money you receive a small black computer which, at first

These can hardly be given an honest criticism when software houses have not had a chance to produce games for them or we to test out the standards and quality of those games.

But we have included a few brief details about six of these machines, which will also provide an idea about how this market is developing.

Finally there are many questions the conscientious buyer can ask himself or his dealer to ensure that he ends up with a computer to suit his needs and his hopes for it. We have included a guide on how to approach buying a microcomputer, compulsory reading for all elves who have to deal with the trade.

aight, looks no bigger and no more than a calculator. You also get a power supply, mains leads to connect your ZX81 to a cassette recorder and to a black and white TV set, and a widely respected instruction manual which teaches you Basic through a series of operating exercises.

If you opt for a ZX81 you

will benefit from the enormous range of software which has been built up.

The basic machine has limited memory capacity with only 1k for user programs. It also has a much-criticised flat, touch-sensitive keyboard.

The ZX81 is easily expandable for beginners who have out-grown the limited capabilities of the standard package. Expansion boxes are available which plug into the back of the ZX81 increasing the memory up to 16K, 32K, or even up to 64K. An inexpensive printer is produced by Sinclair at £59.95.

Games players are also well catered for in the add-on department with joysticks and graphics ROM which enable you to enhance the graphic capabilities of the ZX81.

As an introduction to Basic programming it is still a marvellous buy but the demand for sound and colour graphics and its notoriously inefficient loading ability means that its days are numbered.

JUPITER ACE

Go Forth and conquer the personal computer market.

That's the hope of Cambridge-based Jupiter, which announced its Jupiter Ace microcomputer this summer.

The Ace is unusual in its departure from Basic as the main programming language.

Instead it is offering "the language of the future", Forth.

For a price of £89.95, the Ace

comes with 3K of memory.

It is a high resolution black and white microcomputer designed and produced by two ex-Sinclair engineers.

Jupiter claims that Forth, which can be found on several other microcomputers as a compiler cassette or cartridge, is easy to learn but operates faster than Basic.

The Jupiter Ace is a small computer with push button type keyboard.

ware house is already compiling a comprehensive range of business and home software for the machine.

Both versions offer 16 colours and the text is displayed in 24 rows of 40 characters.

It has a dedicated sound chip and the games enthusiasts are catered for with some pre-programmed sounds, like explosions and laser blaster noises.

A push button calculator style type keyboard makes it still more reminiscent of the Spectrum.

ORIC 1

The Oric 1 is the latest microcomputer to be announced as a rival to the Spectrum.

Designed by Tangerine Computer Systems, the machine will come in 16K and 48K versions and will be launched by Oric Products.

Due out in October, the 16K model will sell for £95 inclusive of VAT and the 48K model will be priced at £169.

It runs on Microsoft Basic and Oric Products claims that a soft-



THE BINATONE COMPUTER

The Binatone Computer is currently causing a good deal of excitement in home computer circles.

Although it is not due to be released until Easter of next year, it does give some indication of how the home computer market is going which is why it has been included here.

It will cost £49.95 and offers 16K of memory expandable up to 64K.

As it's launch is still some time away the details below may change but Binatone are hoping to include 16 colours a Basic as close as possible to Microsoft and a resolution of some 40,000.

Continued on page 91

SANTA'S CHOICE

From page 83
pixels. It will be possible to make up your own graphics symbols.

Binatone are planning to buy in games software from a software house to support the machine, and are taking a similar attitude to Sinclair about

peripherals, ie that specialist companies will provide them.

Final decisions still have to be made about the text display and the keyboard but Binatone claim that the keyboard will be a reasonable size and not touch sensitive

COLOUR GENIE

The Colour Genie will be launched from the Lowe Electronics stable late in October.

The TRS-80 compatible Video Genie was one of the popular early personal computers and the company are producing the colour version at £199 inclusive of VAT.

It has eight colours, a 40 character by 24 line text display and high resolution graphics

ing duces

Where this machine scores over some of its cheaper rivals is in having close compatibility to its predecessor so that games with the colour added can be easily converted.

Already planned are 10 cassettes for launching in the first two months after the micro itself has been brought out. This range should increase to 25 cassettes

COMMODORE 64

The Commodore 64 is being marketed as a business machine but has many features which make it ideal for games players.

It comes with 64K of memory (although only 38K is available for Basic users) which is more than most games will ever require, but at a price of £299 it is still within many computer buyers price range.

A 40 column by 24 lines text display with high resolution, pre-

defined graphics characters and the movable object blocks or SPRITES makes graphical games much easier to program.

SPRITES can also be set up in eight layers giving a 3D effect to colours and a strong sound chip complete the games-playing attributes of this machine.

But the manufacturers are only supporting the 64 with business software it may be some time before games software becomes available for this machine.

ACORN ELECTRON

Acorn has high hopes that its Electron microcomputer will find a ready market wanting to use BBC Basic at a cheaper price.

The Electron comes out at the end of the year but the company are still playing their cards close

to their chest. It will have a 32K of memory and what they describe as a 'mini travel keyboard'.

It will offer the same colour facilities and high resolution as the BBC Microcomputer but at a price of £125.

GLOSSARY OF TERMS

Basic. The most widespread computer language which is one of the easiest to learn and is used for programming all microcomputers.

Cartridge. A one-off computer program contained in a rigid plastic case. Cartridge programs plug directly into the computer and do not require a cassette recorder or a disc drive system to use them.

Cassette. Computer program stored on a cassette tape and loaded into the computer using a conventional cassette recorder.

Compiler. A computer program which can convert programs from one language to another.

Forth. An advanced computer language designed to have a large number of commands in plain English.

Graphics Mode. A facility which enables you to draw on the screen. Many computers feature a special mode for using graphics symbols.

Graphic symbols. Keys which enable you to build up a picture on the screen due to a variety of shades and shapes which they instruct the computer to produce.

High resolution. Drawing graphics in pixels, rather than shapes, which would be a collection of pixels.

Joystick. A small lever mounted on a plastic plinth which enables the player to move objects on the screen.

Memory. The power of a computer is measured in memory capacity. The greater the memory — the larger and more complex the programs that can be entered into it.

Microsoft Basic. A term of Basic.

Pixels. The basic element of a TV screen derived through various types of scanning processes.

Printer interface. Device which enables you to connect a printer to your microcomputer.

Software. Another name for computer programs.

Software House. A company which produces games, educational, or business programs for computers.

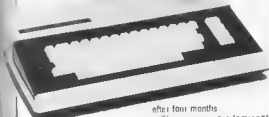
Sound chip. A component specifically designed to store and reproduce sound effects within a computer.

Sprites. Programmable moving characters which greatly enhance the graphic capabilities of your computer.

Text display. The display of written information on the screen.

TRS 80. Tandy computer. Models I, II or III available at upwards of £300.

User Defined Graphics. Graphics created by the programmer with the graphics commands of the microcomputer.



after four months.

These are predominantly games software being written by independent companies.

Lowe is also supporting the computer with a range of peripherals which includes a 16K RAMcard, joysticks, light pen and printer interface cable.

ADDRESS FILE OF MOST POPULAR COMPUTERS

Atari 400

Atari UK, P.O. Box 59, Alport Lane, Wembley Middlesex HA0 1EJ

BBC Microcomputer

BBC Microcomputer Systems, P.O. Box 7, London W3 6JX

Dragon 32

Dragon Data, Dneensway, Swansea Industrial Estate, Swansea SA5 4EH

Sinclair ZX81 and ZX Spectrum

Sinclair Research, 6 Kings Parade, Cambridge CB2 1SN

T.I. 99/4e

Texas Instruments European Consumer Division, Mantion Lane, Bedford MK41 7PA

Vic-20

Commodore, 675, Ajax Avenue, Slough, Berks

ADDRESS FILE OF THE COMPUTER NEWCOMERS

Binatone

Binatone Electronics, Binatone House, Bessford Avenue, Wembley, Middlesex

Colour Genie

Lowe Electronics, Bentley Bridge, Chesterfield Road, Met lock, Derbyshire DE4 5LE

Commodore 64

Commodore, 675, Ajax Avenue, Slough, Berks

Electron

Acorn Computers, Fulbourn Road, Cherry Hinton, Cambridge CB1 4JN

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SANTA'S CHOICE

MORE THAN A TOY

The computer isn't a toy. But it can be a games playing machine with a whole host of possibilities.

It can take the part of an opponent in the traditional games when there isn't a human one available.

Most computers now offer quite sophisticated chess programs which can play up to club standard. Reversi (or Othello), backgammon and draughts are games where the computer can usually beat all but the best human players.

Many games actually improve when played on a computer. Wargaming is an example where the location of a secret squadron can be left lurking in the computers memory until they spring out to surprise their enemy.

Computers can also prove an aid to established games. The role playing fantasy genre of games like Dungeons and Dragons, can now be catered for by computer programs which help plan and design the worlds, treasures and monsters needed for role-playing. A computer version of this type of game is, *Adventure*, which has proved so popular that there are now countless versions available on all types of machine.

But still the most popular games are the arcade variety, needing quick hand-to-eye co-ordination. These are very different from the early space invaders (although they owe a lot to their success).

Arcade games now use 3D graphics, offer different scenarios which require different tactics to master and some fascinating game concepts.

The latest generation of computers are quite capable of reproducing these, mirroring the speed which is essential to the play. The graphical detail so necessary to flashing out the story-line and the sound effects which can drive the player to distraction.

These can be among the most demanding to program but certainly not beyond the determined home user.

IN THE HIGH ST.

This year has seen microcomputers develop a "High Street presence" in stores like W. H. Smiths, Curry, Rumbelows and Dixons.

It has taken the microcomputer industry a long time to admit that its current success is down to the common or garden space invader.

This time last year many of the micro manufacturers were openly disdainful of computer gaming and keen to give the impression that their machines were business tools.

Now the pendulum has swung the other way and the talk is of computers as toys and a £50 price tag is helping to promote that image.

The truth lies somewhere in-between. While many computers are used only for games, they are still much more than toys. Loading up a game of space invaders and blasting away to a high record with some frantic keyboard pummeling is the first

step in the direction of a computer education.

The basic language is a simple one to understand and most children over 10 can quickly grasp the way to print their name 40 times on the household's TV.

Basic is a simple and satisfying language to learn and it should not be long before the user starts using it to produce simple and ultimately, complicated games. While the games themselves may not be the most useful contribution to society, the programming skills needed to produce them can be very demanding.

Computers will play an increasingly important role in our society and learning to use them is going to be just as important. Games playing is as good a way as any of doing this.



Zaxxon: 3D graphics in the arcade

This has made them more visible and accessible but done little to help the uninitiated to appreciate just why they are getting for their money.

Firstly make a checklist of all the hopes and aims you have for your microcomputer and the sort of games you would like to play on it.

Then go along to the computer dealer or high street chain and collar a salesman.

Make sure the salesman you have collared knows his way around the computer, he is going to be your first port-of-call if you need to go back for help later on. Don't let him confuse you with jargon, every computer term can be broken down into plain English.

Memory sizes are measured in kilobytes, usually abbreviated to "K". Rather than getting bogged down

in what kilobyte stands for, remember that a 16K machine will be able to produce most simple arcade games. More complicated adventure games and arcade games will need 24 or 32K and a decent database of files will need over 48K of memory.

Get the salesman to demonstrate the graphics facilities. Most of these computers now come with a display top but a good salesman should be able to show how to produce high resolution using DRAW and PLOT commands. Ask if user-definable graphics are possible on the machine - these enable you to draw your own space invaders.

What colours and sounds are possible. Look out for flicker at the edge of the screen and make sure the text on the screen is

able to be read.

Ask to see a copy of the manual and look through a section to see if it includes examples of code and exercises for the user to try out and learn from. Is it expressed in plain English? Does it have a good index at the back and a good description of the chapters for easy reference at the front?

What software back-up is there for the machine and does it include the type of games programs you are interested in? Find out if the computer manufacturer supports his own machine with software or if it all comes from independent software houses.

Things like joysticks, light pens, printers and toolkits are known as peripherals. These are the add-on extras which can boost a computer's potential. Again check on the range and where these items can be obtained from.

The bugbear of many a computer owner is loading software. Ask the salesman to demonstrate a simple loading procedure to you and watch out for difficulties and excuses. Check if the machine needs a special cassette recorder and if so what additional expense this will cause.

THE KEY AREAS

Graphics, sound and memory are three key areas to look at when choosing a good games computer.

The memory will be needed to produce the text-based adventure games and the vast lines of DATA which they usually feature.

The graphics facilities should include high resolution and user-definable graphics to help reproduce the arcade game quality of game design.

Ideally the sound chip should include a white noise voice to give the laser blast and explosion noises which are such a feature of arcade games.

Eight colours will usually suffice for most screen displays and if the computer does not offer a good keyboard, check to see if there is a joystick available or you could end up frustrated at being blown up while pressing the wrong key.

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SOFTWARE SOFTWARE SOFTWARE SO REVIEWS

MAZE MAN WITH STICKY FINGERS!

With the disappearance of Bug Byte's excellent version of Pacman for the VIC20 under the threat of legal action from Atari — the owners of the Pacman copyright — we review another version of the game with the little yellow gobbler.

Packman has all the principle features of the arcade game. The ghosts chase you through a maze full of dots which you must eat up as you go along. If you eat the power pills in the corners of the maze you can then eat the ghosts for a brief few seconds to score bonus points.

Every so often a bunch of cherries appear in the centre of the maze which, if you can manage to eat them are worth a lot of extra points.

The graphics are surprisingly clear considering that the game is written for the unexpanded VIC.

My main criticism is that the Pacman is difficult to negotiate through the maze as



Once you press a key to move him he will continue in that direction even when you take your finger off the key.

Peckman is available from Mac games of Port Talbot at £5.50.

- Getting started 3
- Value 7
- Playability 6

BEWARE THE BLACK RIDERS

Shadowfax, as Lord of the Rings fans will know, is a horse belonging to Gandalf the White Wizard — the swiftest horse in Middle Earth.

This is your chance to ride Shadowfax as you gallop against the Black Riders of Sauron — the Dark Lord of Mordor.

The idea of the game is to shoot as many of the advancing Black Riders as possible. To kill the riders you must release a thunderbolt by pressing the shift key. You must quickly release the key again when the bolt is centred on a Black Rider. This will cause the bolt to explode -- killing the rider -- which will then glow red and gradually fade away. If you fail to release the key quickly enough the bolt will pass through your target and leave him unharmed.

But it's the graphics on Shadowfax that are truly impressive. The hoises look — and sound — most lifelike.

My one criticism of the game is the lack of variety in terms of opponents. It would have been really nice to have a few Orcs and Elves to deal with as well as the dark riders.

Despite this — my overall impression was of a most enjoyable and compulsive game. At £6.99 Shadowlex is every bit as playable as some of the cartridge games!

have seen retailing at well over £20

Shadowfax comes on cassette for the VIC-20 and does not require any RAM expansion. It is manufactured by the new VIC software writers, Postern Limited, and will be available from most good computer shops or by mail order from the Cheltenham based company.

- Getting started 7
- Value 7
- Playability 7



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E SOFTWARE SOFTWARE SOFTWARE REVIEWS

LET'S HUNT THE INVADERS

INVADERS FOR THE SPECTRUM

As the race continues among software
houses to produce games for the Sinclair
Spectrum we decided to test the three
Space Invader games that have so far
been produced for this fledgling machine.

Spectral Invaders was the first game on
the market for the Spectrum and marked
another first for the Liverpool firm Bug
Byte.

The game is a fairly authentic version of
the arcade classic. It loaded without difficul-
ty and started according to the
instructions.

The main drawbacks were that the gun

can hardly fail to hit something once you
get a missile in the air.

The mystery flying saucers didn't look
too much like flying saucers and moved so
slowly they could be picked off with ease.

About the only department in which the
Pison game beats the other two versions
was sound. The Spectrum produced clear
well synchronised beeps as the ships
exploded.

Space Raiders loaded well - the Pison
logo appearing seconds after the play
button on tape was depressed - cutting
out some of the not-bitting I experienced



lurel responded slowly to the keys and did
not explode until a split second after it had
been hit, continuing to move right or left.
The missiles were also slow movers -
jerking awkwardly skywards.

The Invaders themselves did not explode
immediately they had been hit either
causing you to hesitate, unsure if you had
hit them or not.

On the plus side Spectral Invaders was
the only game of the three we looked at
that offered a two player game. It had the
fastest and most authentic mystery flying
saucers. It also had the best score board,
flashing to indicate player one or two.

Despite its faults, Spectral Invaders was
the only version that looked and felt at all
similar to arcade Space Invaders.

Pison Software - the official Sinclair
software writers - entered the field with
Space Raiders, the slowest version we
tested.

The Invaders don't move down the
screen in vertical columns in this version
making them particularly easy to hit. Their
side-stepping motion means that the gaps
between the columns are blocked so you

with other Spectrum games.

Southampton firm Quicksilver were hot
on the heels of Bug Byte with their version
of Invaders for the Spectrum - Space
Invaders.

This was the fastest of the three games.
So fast in fact that it detracted from the
playability of the game. Not because it
made it impossibly difficult, but because
you had such a speed advantage over the
advancing fleet that you could shoot them
down with ease.

The missiles could be fired far too fast
and furiously. You could kill a whole
column of Invaders in a split second, some-
times without dodging right or left, which in
turn made the fleet relatively easy to defeat.

In fairness to Quicksilver their version
does have a number of features which the
others do not.

Most useful of these is a hold button
which enables you to answer the phone or
make a cup of tea and then continue where
you left off when you are ready. It also has
a high score facility which enables you to

SOFTWARE SOFTWARE SOFTWARE REVIEWS

enter the top ten high scores of the session with the initials of the players.

Space Invaders displays clear instructions on the screen and also gives you the value of the various invaders. Extra features are, however, no substitute for a good playable game, which I do not feel this version from Quicksilver gives you.

For my £5 Bug Byte offers the best game of Space Invaders on the Spectrum so far.

Bug Byte

- Getting started 7
- Value 7
- Playability 7

Quicksilver

- Getting started 6
- Value 6
- Playability 5

Pson

- Getting started 8
- Value 4
- Playability 4

SMART BOMBS, SMART GAME

Defender is not a game you can pick up in five minutes before leaving for a dinner party.

Three hours later you will be cursing the anxious would-be host for phoning to interrupt you while you still had a smart bomb and three humanoid left on wave three.

In the arcades, Defender players earned their expertise through a mint of 10p's. On the BBC Model B Microcomputer, you have to be prepared to sacrifice time — lots of it — to enjoy the satisfaction of smart bombing the Pods at the start of wave three.

A lot of people are put off Defender by the vast range of control buttons. There are seven of them: Up, Down, Thrust, Fire, Smart Bomb, Reverse and Hyperspace.

At the start you doubt that you will ever master them but slowly the game starts to make sense. Up and Down come first, then remember not to Thrust too quickly and don't spare the Fire button unless the humanoids, you must defend, are climbing into dangerous positions on the monotonous scenery.

Soon you will have cleared the first wave of 15 Lander aliens and found yourself just starting to gain confidence in Reverse and thumping down on the Smart Bomb in tight situations.

For the uninitiated, Defender puts you in a craft above a bumpy landscape, charged with the task of stopping aliens kidnapping humanoid figures from the surface.

The most dangerous opponents are the



Illustration: Terry Rogers

DEFENDER

Mutant, Bomber and Swarmer craft but you are responsible for the appearance of all of these.

Mutants only appear if you let a Lander craft steal a humanoid to the top of the screen.

Bombers, only if you dally too long on one wave and Swarmers only come into the game when you blow-up a harmless Pod — so only do it when you are ready to deal with them.

In Defender you are responsible for everything that happens to you. And even the "easy" first wave is crucial to your future survival in the game so treat it with due respect.

Extra lives are awarded every 10,000 points, an extra Smart Bomb too but a new batch of humanoids is only given to you each fourth wave. And if you lose all your humanoids, all hell is let loose.

When you have just flown your last man into a pack of Swarmers, quite forgetting that you still had another Smart Bomb left and the split second the machine takes to set up a new game seems like a frustrating eternity, you'll realise why Defender has enjoyed such a long reign as king of the arcade games. Sheer compulsion at £9.95 inclusive of Vat.

- Getting started 7
- Value 9
- Playability 10

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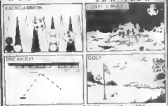
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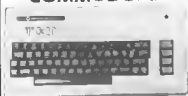
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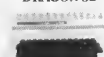
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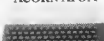
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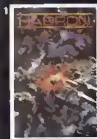
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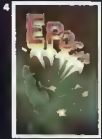
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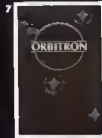
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